A GEOMETRICALL EXTRACTION, OR A COMPENDIOVS COLLECTION of the Chiefe and choyſe Problemes,

Collected out of the beſt, and lateſt Writers.

VVHEREVNTO IS ADDED, about 30. Problemes of the Authors Inuention, being for the moſt part, performed by a better and briefer way,

then by any former Writer.

By IOHN SPEIDELL, *practitioner in the Mathematicks, and profeſſor thereof in London.*

LONDON,

Printed by *Edward Allde*, and are to be ſolde at the Authors houſe in the fields betweene Princes ſtreete and the Cockpit.

1617.

TO THE HONORABLE

KNIGHT SIR IOHN EGERTON, *HEIRE apparant to the right honorable* Thomas *Lord* Elleſmere, *Lord high Chancelor of England.*

SIR,

I ſhould not ſo boldly aduenture, to ſhrowd this weak work of mine vnder your worthy Patronage, were I not aſſured, that as in your iudgement you are able to diſcerne, ſo in your noble diſpoſition, you will fauorably accept theſe firſt fruits of mine: In which kinde it hath pleaſed you ſome time to haue had conference with me, hauing to your bountifull rewards bene pleaſed to adde a plentifull report of your good opinion had and helde of me. Conſcerning the worke it ſelfe, though it be little, yet I hope it will appeare both for the matter and manner, greater in value then in volume, contayning of the chiefeſt things, partly collected out of others,

and partly of my owne, and performed by a more ſpeedy way then by any former Writer. Infine whatſoeuer the booke is or ſhall be, I eſteeme it too little, to expreſſe my thankfull minde for your many fauours, wherein I ſhall euer be ſtudious to ſupply my other wants, by my beſt endeuours, and euer reſt, At

Your honourable diſpoſition,

Io: Speidell.

To the Reader.

COurteous Reader, Hauing for these tenne yeares space, beene a professor of the Mathematickes in this Cittie, during which time, I haue instructed many Gentlemen and others (in Arithmeticke, Geometrie, Astronomy, And also, haue perused all the best authors, that I could get, in Latine, Italian, French, English, high Duch, and Flemish, and not hauing found this part which I here present to thy view, (consisting of the best, choyse, and most artificiall Problemes) so amplie, and after so breife a way performed by any: It hath made me therefore the more bolde to present it before thee, wherin I haue indeauoured to be briefe, knowing that much superfluitie of words doth more let and hinder, then any way further, or aduance the matter, yet not so briefe, as thereby to obscure or darken the worke in any kinde, but to make it the more cleere, easie, and plaine to the reader, and for the better satisfaction of such as desire the demonstration of euery thing. I haue coated in the margent such places of Euclide as tend thereunto, and for a further light, haue in the most principall places set Arithmeticall numbers by the Diagrams, whereby such as are desirous to make triall that way, may finde satisfaction. And not only these Problemes contained in this booke (well-beloued Reader) but much more viz. in Arithmeticke, Geometrie, Astronomie, Nauigation, Surueighing, fortification, achitecture, taking of heigths & distances, and all other parts of the Mathematicks, &c. may be performed by a Mathematicall

ticall Scale now newly (this preſent yeare) by me inuented, farre beyond my former Scale made in Anno. 1607. *the which with all other Mathematicall inſtruments, are made by my louing friends* Mr Elias Allen, *ouer againſt* St. Clements *Church in the Strand, in* Braſſe; *and* Mr. Iohn Tomſon *in Hoſier lane by Smithfield (in Wood) and may alſo both in Wood and Braſſe be had, with the inſtructions ther of by me at my houſe: Thus deſiring thee friendly Reader to peruſe this worke with iudgement, and not raſhly to ſpeake euill of him that hath not harmed thee, but taken much labour and paines day and night to compoſe, collect, and peruſe this work for thy good: ſo ſhalt thou walke charitably, and giue me occaſion to deſerue thy further loue, in ſetting forth a ſecond part, The which I promiſe to performe God willing, as I ſhall perceaue this to be reſpected, and ſo for this time I reſt, remaining,*

Thy louing friend

I. Sp.

A GEOMETRICALL EXTRACTION,

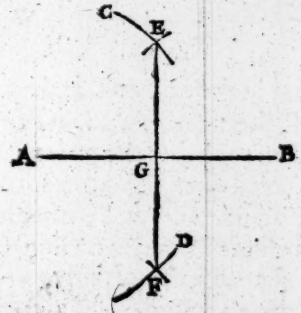
Teaching the Conſtruction of diuers of the moſt choiſe and chiefe Probleames.

Verie profitable, & in performance moſt pleaſant and delightfull.

PROBLEME I.

To deuide a line giuen into two equall parts at right angles.

Let A B. be a line giuen to be ſo deuided.



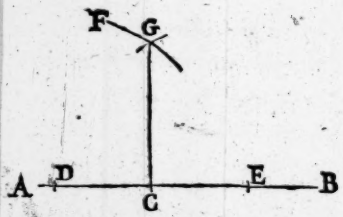
FIrſt ſet one foot in the end A. and opening the other foot at pleaſure to aboue halfe the line AB. make the arches C & D. aboue and belowe, then with the ſame diſtance ſetting one foot in the other end B. croſſe thoſe arches in E. and F. Laſtly drawe the 10. 1

line E. F. which ſhall deuide the line A. B. into two equall parts in G. as was required.

Prob. II.

Vppon a point in a line giuen, to erect a perpendicular.

Let A. B. be a line giuen, and let C. be a point aſſigned therein, whereuppon it is required, to erect a perpendicular.



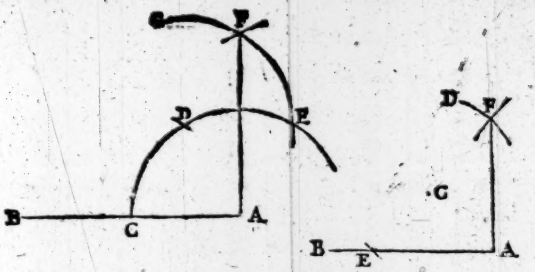
FIrſt ſet one foot in the point C. and open the other foot to almoſt the neereſt end A. and make the points D and E. on each ſide the point C. That done ſet one foot in D. and open the other foot at pleaſure
11.1. to ſome wyder diſtance, and make ouer head the arch F. Then with the ſame diſtance ſetting one foote in E. Croſſe the ſaid arch in G. Laſtly, drawe the line G. C. which ſhall be a perpendicular to A. B. vppon the point C. required.

Prob. III.

To erect a perpendicular vppon the end of a line.

Let A. B. be a line giuen, and let it be required to erect a perpendicular vppon the end A.

Set



SEt one foot in the end A. and opening your Compasses at pleasure, make the arch CDE. Then with the same distance setting one foot in C. crosse that arch in D. that done, keep one foot in D. and make with the other, the arch E G. Then set one foot in E, and with the same distance crosse the said arch E G, in F. Lastly, drawe the line F A. which shall be a perpendicular vpon the end A of the line A B. which was required.

Another way.

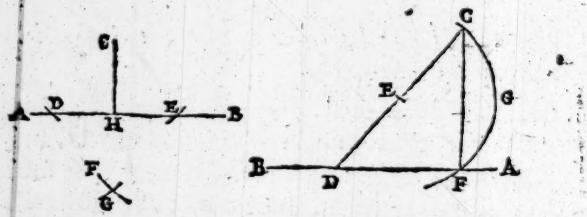
AGaine, let in the last *Diagram* on the right hand A B. be a line giuen, and it is required vppon the end A. thereof, to erect a perpendicular.

Set one foot in the end A. and with the other take a point at pleasure as C. then keeping one foot in C. make aloft the arch D, and crosse also the line A B. in E. That done, lay your Rular by the points E C. and where it crosseth the arch D set F. Lastly drawe the line F A. which shall be a perpendicular to A B. vpon the end A. as was required. 31. 3.

Prob: IIII.

From a point aloft, to let fall a perpendicular to a line giuen.

Let A B. be a line giuen, and let C. be a point aloft, from whence it is required to let fall a perpendicular to A B.



SEt one foot in C. and opening the other foot almoſt to the neereſt end A. make in the line A B, the markes D. and E. Then ſet one foot in E. and with
I. 12,1. the ſame diſtance make vnderneath the arch F. ſet alſo one foot in D. and croſſe the ſide arch F. in G. Laſtly, lay your Rular by the points C G. and drawe the line C H. which ſhall be a perpendicular to A B. from the point C. according to your deſire.

Another way.

AGaine, in the laſt *Diagram*, on the right hand, Let A B. be a line giuen, & let C. be a point aloft, from whence it is required to let fall a perpendicular to A B.

Laye

Laye the Rular by the point C. and any part of the line A B. as D. and drawe the line C D. which deuide into two equall parts in E. then keeping one foote 31.3
in E. with the distance E C. make the arch C G F. to cut A B. in F. Lastly, drawe the line C F. which performeth the demaund.

Prob. V.

To drawe a Parralell to a line giuen.

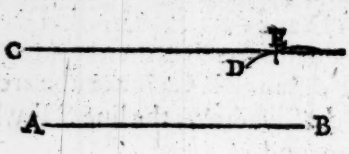
Let A B. be a line giuen, whereunto it is required to drawe a Parralell

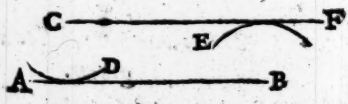
SEt one foot in the end A. & opening the other foot at pleasure, make ouer head the arch E. Then with the same distance, Setting one foot in the other end B. make the arch D. Lastly, lay your Rular by the tippes of those arches, and drawe the line F G. which shall be a Parralell to A B. as was required.

Prob. VI.

To drawe a Parralell to a line giuen, from a point assigned.

Let A B. be a line giuen, and let C. be a point assigned, from whence a parralell is to be drawne to A. B.





SEt one foote in the ... and extend the other to ... let one foot in B. & make with ...stance the arch D. That done, take the whole line AB. and setting one foot in C. with the
31. I. other crosse the arch D. in E. Lastly, drawe the line CE. which shall be a parralell from C, to AB. as was required.

Another way.

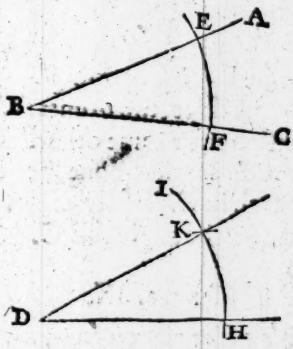
AGaine, in the former *Diagram* belowe, let AB. be a line giuen, & C. a point assigned, from whence it is required to drawe a parralell to AB.

Set one foot in C. and taking the shortest distance to AB. make the arch D. to touch the line AB. Then with the same distance setting one foote in the end B. with the other make the arch E. That done, lay your Rular by the point C. and the tippe of the arch E. and drawe the line C.F. which shall be a parralell to AB. as was required.

Prob. VII.

To make an angle, Equall to an angle giuen.

Let A B C. be an angle giuen. And it is required to make another angle equall thereunto.



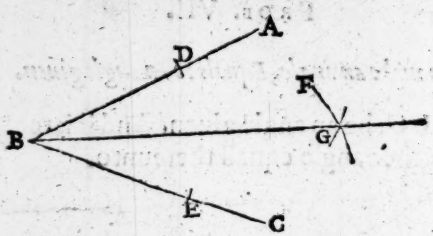
FIrſt drawe any where a line as D H. Then ſetting one foot in the angle B. open the other, to almoſt the end A. or the end C. and make the arch E F. Alſo ſet one foot in the end D. (of the line DH.) and with the ſame diſtance make the arch H I. That done, take the diſtance F E. and ſetting one foot in H. croſſe the arch H I. in K. Laſtly draw the line D K. which ſhall include the angle K D H. equall to the angle A B C. required. 23.1

Prob. VIII.

To deuide an Angle giuen into two equall partes.

Let ABC. bee an angle giuen, to bee deuided into two equall parts.

Set one

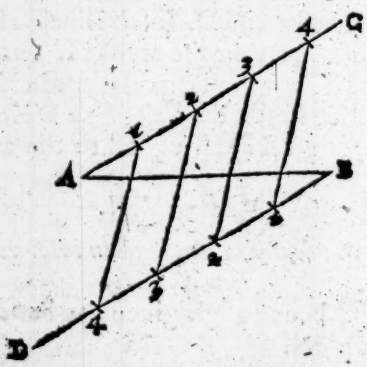


SEt one foot in B. and opening the other at pleaſure, make in the ſides, the points D. and E. Then with the ſame diſtance or ſome other, ſetting one foot
9.1 in E. make the arch F. that done, ſet one foot in D. and croſſe that arch in G. Laſtly drawe the line B G. which ſhall deuide the angle A B C. into two equall parts required.

PROB. IX.

To deuide a Line giuen into any number of equall parts required.

Let A B. bee a Line giuen, to bee deuided into fiue equall parts.



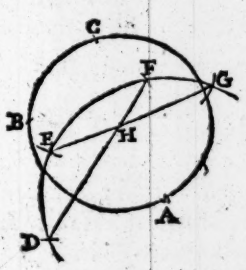
First

FIrſt from the end A. drawe a line at pleaſure, making with the giuen line AB. any kinde of angle, as the angle B A C. then by the ſeauenth Propoſition make the angle D B A. equall thereunto by drawing the line B D. That done, ſet from A. towards C. foure equall ſpaces at pleaſure, (alwaies one leſſe then the number whereinto the line giuen is to be deuided) Likewiſe beginning at B. ſet vppon the line B D. the ſame foure equall ſpaces from B. towards D. as you ſee on both ſides, numbred by 1.2.3.4. Laſtly, drawe croſſe lines from one point to the other, to cut the line A B. ſo ſhall you deuide it into fiue equall parts required. 9. 6.

PROB. X.

To bring three points not lying in a ſtraight line, into one circomference.

Let A B C. be three points giuen, to be brought into one Circomference.



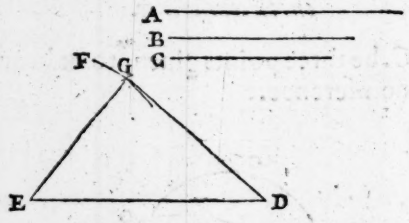
SEt one foot in A. and opening your Compaſſes to aboue halfe the diſtance A B. make the arch D E F G.

Then with the ſame diſtance, ſetting one foote in B. croſſe that arch in the points D F. and drawe the line D F. Then ſet alſo one foot in C. and with the ſame diſtance croſſe againe that arch in the points GE. and drawe alſo the line E G. which cutteth the line D F. in H. So is H, the Center: Therefore ſet one foot in H. and extend the other to any of the points A B C and make the Circle A B C. which ſhall paſſe by the three giuen points required.

Prob. XI.

Of three lines giuen, ſo the two ſhorteſt together be longer then the third, to make a Triangle.

Let A B, and C. bee three lines giuen, whereof it is required to make a Triangle.



TAke the line A. and laye it downe from D, to E. Then take the line C. with your Compaſſes: and ſetting one foot in E, make the arch F. that done take the line B. and ſetting one foote in the end D. with the other croſſe that arch in G. Laſtly, drawe the lines D G. and GE. ſo ſhall you include the Triangle D G E. whoſe three ſides ſhall be equall to the three lines A. B. C. required.

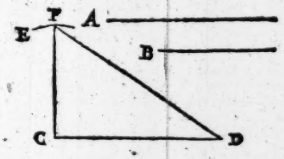
22. I.

Prob. XII

Prob. XII.

To make a right angled Triangle, the two containing sides being giuen.

Let A B. be the two Containing sides, and it is required, to make a right angled Triangle.

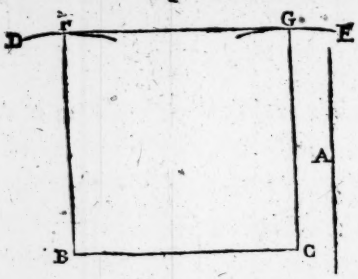


TAke with your Compasses, the line A. and laye that downe from C, to D. Then take also the line B. and setting one foot in the end C. with the other make the arch E. That done by the third proposition vppon the end C. erect a perpendicular to cut the arch E, in F. Lastly, drawe the line F D. so shall you include the right angled Triangle C D F. whose two containing sides C D, and C F. are equall to the giuen lines A, & B. which was required. 31.3.

Prob. XIII.

To make a square, the side being giuen.

Let A, be the side of a square and it is required to make out the square.

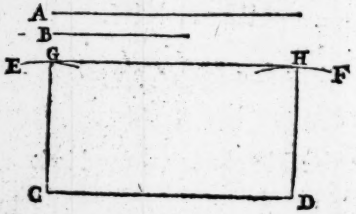


TAke the line A. with your Compaſſes, and laye that downe from B, to C. then with the diſtance B C: ſetting one foote in B. make the arch D. Set alſo one foot in C, and make the arch E. Then by the third Propoſition, erect a perpendicular vppon the end B, to cut the arch D, in F. That done, take the
46, 1. diſtance BC, and ſetting one foote in F, with the other croſſe the arch E, in G. Laſtly, drawe the lines F G, and G C, ſo ſhall you include the Square BFGC, whoſe ſide ſhall be equall to the line A, required.

PROB. XIIII.

To make a Parralellograme or a long Square, the length and breadth being giuen.

Let A, and B, be the length and breadth giuen, and it is required to make the long ſquare.



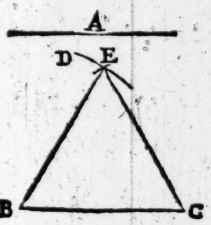
Take

TAke the length A, with your Compaſſes, and lay that downe from C, to D. Then take alſo the breadth B. and ſetting one foote in the end C, with the other make the arch E. the like doe at the end D. and make the arch F. Then by the third propoſition vppon the end C, erect a perpendicular, to cut the arch E, in G. That done, take the length C D, and ſetting one foot in G. with the other croſſe the arch F, in H. Laſtly, drawe the lines GH. and H D. ſo ſhall you include the long ſquare C G H D. whoſe length and breadth ſhall be equall to the lines A, and B, required. 31.3 31.1.

Prob. XV.

To make an Equilater triangle, the ſide being giuen.

Let A, be a line giuen, and it is required to make an Equilaterall triangle, whoſe ſide ſhall bee equall thereunto.



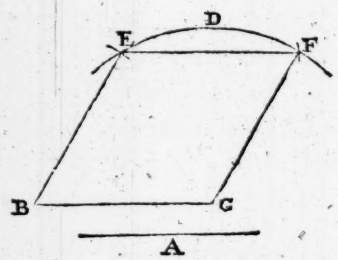
TAke the line A. and lay it downe from B. to C. Then with the ſame diſtance, ſetting one foot in B, with the other make the arch D. that done, ſet one

foot in C, and crosse the arch in E. Lastly, drawe the lines B E, and E C. so shall the Triangle B E C, be equilaterall, and his side equall to the giuen line A. which was required to be made.

Prob. XVI.

To make a Rombus the side being giuen.

Let A. be a line giuen, and it is required to make a Rombus, whose side shall be equall thereunto.

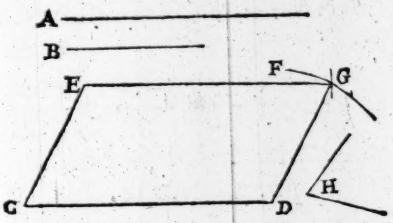


TAke the line A, and lay it downe from B, to C. then with the same distance, setting one foot in C. make the arch D. that done, set one foot in B, and crosse that arch in E. Againe, set one foot in E. and
1.1. crosse the same arch againe in F. Lastly, drawe the lines B E. E F. and F C. so shall you inclose the Rombus B E F C. whose side shall be equall to the line A, required.

PROB. XVII.

To make a Romboides, the length and breadth being giuen.

Let A, and B. be the length and breadth giuen, and it is required to make the Romboides.



TAke the length A, and lay it downe from C, to D. Then take also the breadth B, and setting one foot in the end C, with the other, take any where a point as E. and drawe CE. then with the same distance setting one foot in the end D, with the other make the arch F. That done, take the whole length C D, and setting one foot in E, with the other crosse the arch F, in G. Lastly, drawe the lines E G, and G D. so shall you include the Romboides C E GD, whose length and breadth shall be equall to the lines A, and B, required. 1. Pet. 31.1

PROB: 18.

To make a Romboides the length, and breadth being giuen, whose two opposite angles shall be each equall to an angle giuen.

Let in the first Diagram A, and B. bee the length and

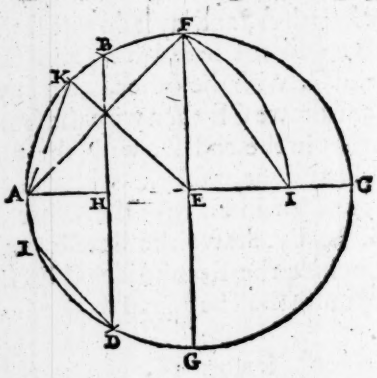
and breadth giuen, and let it be required to make a
23.1 Romboides whose length and breadth shall be equall
31.1. thereunto, and hauing two of his opposite angles, each equall to the angle H.

First laye downe the length from C, to D. Then by the seauenth proposition make the angle E C D. equall to the angle H. Yet drawe the line C E. but of the length of the line B, and then finish it as in the last proposition.

Prob: XIX.

To deuide a Circomference of a Circle into any part not aboue 10.

Let A B C D. bee a circle giuen to be so deuided.



First drawe the Diameter A E C, which deuides the Circomference into two equall parts. Then take the semi-diameter, and setting one foote in A. with the other foot make in the Circomference the points B and D.

B, and D. and drawe B D, which ſhall goe thriſe about the Circle. That done, by the firſt Propoſition deuide the Diameter A C. into two equall parts at right angles with F G. then drawe A F, which ſhall be ⅓ part. That done, ſet one foote in H. (where the third part cutteth the Diameter A C.) and extend the other to F, and make the arch F I. then drawe the right line F I. which ſhall be ⅒ part. 17. Diſi. 15. 4. 6. 4. 6. 2. 47. 1. 9 10 13

The ſixt part is alwaies the Semi-diamiter.

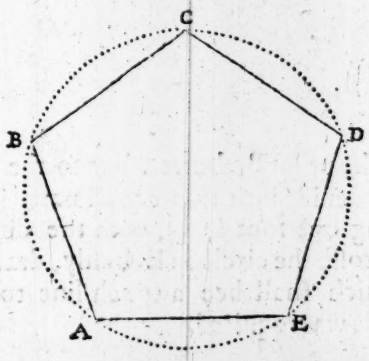
The ⅐ part is halfe the third, viz. B H, or H D. For the eight part, deuide by the eight propoſition the angle A E F, into two equall parts, with the line E K, which cutteth the lymbe in K. then drawe A K. which ſhall be the eight part.

For the ninth take alwaies ⅓ of the arch B A D, as D L.

The tenth is alwaies the line E I.

Prob. XX.

To make a Poligon of fiue equall ſides and angles, otherwaies called a Pentagon.

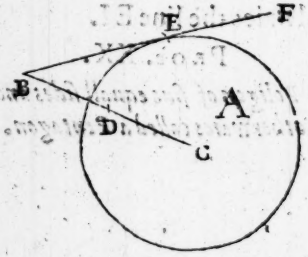


FIrſt make an obſcure Circle, then by the laſt Propoſition finde the fift part, which ſet fiue times about in the lymbe, as you ſee by the letters ABCDE, and drawe lines from point to point, ſo ſhall you include a Pentagon, as ABCDE, which was required.

Prob. XXI.

From a point aſsigned, to drawe a touch line to a Circle giuen.

Let A, be a Circle giuen, and let it be required to drawe a touch line thereunto from the point B.



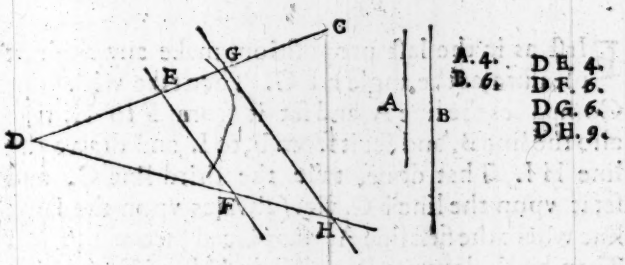
FRom the point B, drawe a line to the Center C, which deuide into two equall parts in D. Then keeping one foot in D, with the diſtance DB. or DC. croſſe the circle in E. Laſtly, drawe the line 17.3. BEF, which ſhall bee a touch line to the giuen Circle A. as was required.

Prob. XXII.

Prob: XXII.

Vnto two lines giuen, to finde a third proportionall line.

Let A and B. be two lines giuen, and let it be required to finde a third line in proportion to them.

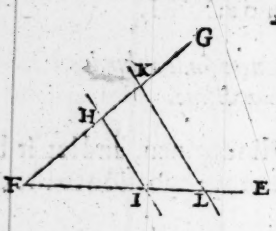


FIrst make any angle as C D H. then set the line A, from D. to E, and the line B. from D to F. and also from D, to G. Then drawe E F. that done, by the point G. drawe a Parralell to E F. as G H. so shall D H, be the third proportionall line required. 11.6.

Prob. XXIII.

Vnto three lines giuen, to finde a fourth in proportion, that is to performe the rule of three in lines.

Let, A B, and C. be three lines giuen, and it is required to finde a fourth proportionall line.



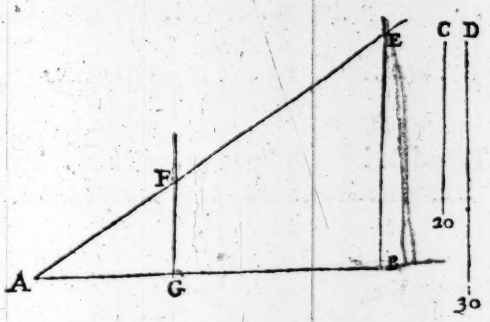
FIrſt as in the laſt propoſition, make any angle at pleaſure, as the angle E F G. Then take with your Compaſſes the line A, and ſet it from F to H. take alſo the line B, and ſet it from F, to I. and drawe the line H I. That done, take the third line C, and
12.6. ſet it vpon the line F G, viz. (alwaies vpon the ſame line where the firſt line A, was placed) from F, to K. Then by K, drawe a Parralell to H I. as K L. to cut F E, in L. ſo ſhall F L. be the fourth proportionall line required.

Prob. XXIIII.

To deuide a line giuen, into two parts, in proportion one to the other according to two lines giuen.

Let A B, be a line giuen, to be deuided into two ſuch parts, that the leſſer may be in proportion to the greater: as the line C, to the line D.

From



AF. 30.
FE. 30.
AG. 16.
GB. 24.

FRom the end A, drawe the line AE, making the angle BAE. then ſet the line C, from A, to F, and the line D, from F, to E. and drawe the line EB. Laſtly, by the point F, drawe a Parralell to EB, as FG, to cut AB, in G. ſo ſhall AB, be deuided in G. as C, to D. which was required. 10.6.

PROB. XXV.

To cut off from a line giuen, any part or parts required.

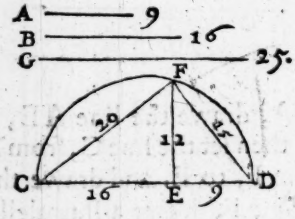
Let in the laſt Diagram, AB, be a line giuen, and let it be required to cut off from it $\frac{2}{5}$ parts.

FIrſt from the end A, drawe the line AE, making any angle as BAE, then ſet on any fiue equall parts from A to E, and alſo two of the ſame parts from A, to F. That done, drawe the line EB. Then by F, drawe a Parralell thereunto, to cut AB, in G. ſo ſhall AG, be the $\frac{2}{5}$ parts of AB, which was required. 9.6.

Prob. XXVI.

Betweene two lines giuen, to finde a meane proportion.

Let A, and B. be two lines giuen, betweene the which it is required to finde a meane proportion.



Ioyne the lines A, and B, so together that they make one right line as C D, being ioyned together in the point E. and vppon the line C D, describe the Semi-
13.6. circle viz. C F D. Then vppon the point E, where the lines A, and B. being ioyned together meet, erect a Perpendicular to cut the lymbe in F. as E F, which shall be a meane proportion betweene the lines A, and B, required.

Another way.

AGaine, in the same Diagram, let the lines A, and G, be giuen, betweene the which it is required to finde a meane proportion. Take the line G. and laye it downe from C, to D. and drawe C D, where-

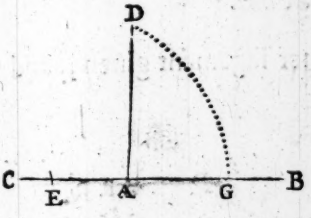
vpon

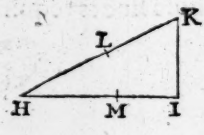
vpon deſcribe the Semi-circle C F D. Then take the line A. and ſet it from D, to E. then vppon the point E. erect a perpendicular to cut the lymbe in F. Laſtly, drawe D F. which ſhall be a meane proportion betweene D E, and D C. or betweene the lines A, and G, required: and if you drawe C F. it ſhall be a meane betweene B. and G. that is betweene C E, and C D. 31.3. 8.6 4.6.

Prob. XXVII.

To deuide a line giuen, by Extreame and meane proportion.

Let A B, be a line giuen to be deuided by extreame and meane.





AB. 10 AG. R. 125—5.

IH. 10. IK. 5. HL. or HM. R. 125.—5

INcreaſe A B. at length to C. Then vpon the point A. erect a Perpendicular as A D. of the length of A B. That done, take halfe A D. or A B. and ſet it from A. to E. then with the diſtance E D. make the arch D G. ſo ſhall A B. be deuided by extreame and meane proportion in G. and A G. is the greater ſegement, and G B the leſſer. 11.2.

Another

Another way.

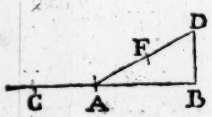
Againe, in the last Diagram let H I. be a line giuen, to be deuided by extreame and meane proportion.

VPon the end I. erect a perpendicular as I K. of the length of halfe the giuen line H I. then drawe the
11.2 subtendant side H K. that done, set K I. from K. to L. Againe, set H L. from H. to M. so shall H I. be deuided by extreame and meane proportion in M. And H M. shall be the greater segement, and M I. the lesser.

Prob. XXVIII.

The greater segement of a line deuided by extreame and meane proportion being giuen, to finde the whole line.

Let B A. be the greater segement giuen, and the whole line is required.



A B. R.
125 - 5
C B. 10

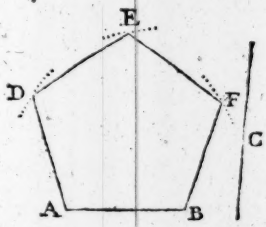
INcrease B A. to C. then vppon the end B. erect a perpendicular of $\frac{1}{2}$ the length of A B. as B D. And drawe the subtendant side A D. From which sub-
2.Theo.13 stract D B. rest A F. that done, set A F. from A. to C. so shall C B. be the whole line required.

Prob. XXIX

PROB. XXIX.

Vpon a line giuen to describe a Pentagon.

Let A B. be a line giuen, whereupon a Pentagon is to be made.

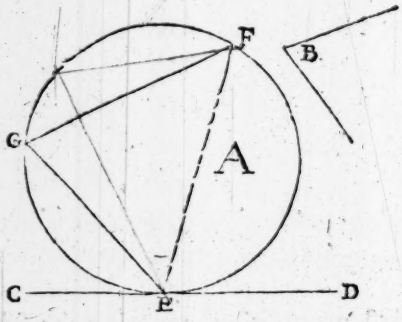


BY the last proposition, counting the side A B. to be the greater segement of a line deuided by extreame and meane proportion, finde the whole line, which let be the line C. Then with that distance setting one foot in B. make the arches D and E. Also set one foot in A. and make the arch F. That done, with the distance of the giuen side A B. setting one foot in A. crosse the arch D in D. and setting one foote in B. crosse the arch F in F. also set one foot in F. and crosse the arch E in E. Lastly, drawe the lines A D, D E, E F, F B. so shall you include the Pentagon A D E F B. being made vpon the line A B. which was required. 8.13.

Prob. XXX.

From a Circle giuen, to cut of a ſection, wherein may be placed an angle, equall to an angle giuen.

Let A. be a Circle giuen, from the which it is required, to cut off a ſection wherein may bee placed, an angle equall to the angle B.

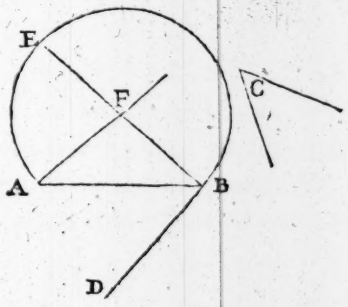


FIrſt drawe a touch line by the 21. propoſition as C D. which toucheth the circle in E. then vpon the point E. (by the ſeauenth propoſition) make the angle D E F. equall to the angle B. by drawing the line
34.3. E F. ſo ſhall the ſection E F G. Containe an angle equall to the angle B. required: for count E F. the baſe of ſome triangle, and then from the ends E and F. drawe lines to any point in the Circomference, as the lines E G. and F G. meeting in the point G. and then the angle G. ſhall bee equall to the angle B. as a foreſaid.

Prob. XXXI.

Vpon a line giuen, to deſcribe ſuch a ſection of a Circle, as may containe an angle, equall to an angle giuen.

Let A B, be a line giuen, and it is required thereon, to deſcribe a ſection of a circle that may containe an angle, equall to the angle C.

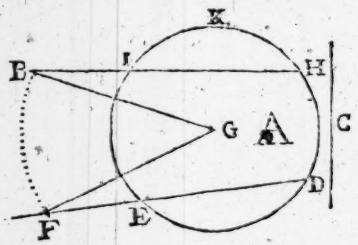


BY the ſeauenth propoſition drawe the line B D. making the angle A B D. equall to C. the angle giuen. Then vpon the point B. erect a Perpendicular to DB, as B E. That done, make the angle F A B. equall to the Angle A B E. by drawing the line A F. 33.3. which cutteth BE in F. ſo ſhall F be the Center, therefore, ſet one foote in F. and extend the other to any of the ends A, or B. and make the arch A E B. which ſhall containe an angle equall to the angle C, required.

Prob. XXXII.

From a point assigned, to drawe a line to cut off an arch of a Circle, whose chorde shall be equall to a line giuen, the said Chorde being lesse then the Diameter of the Circle.

Let A, be a Circle giuen, and let B, be a point assigned, from whence it is required to drawe a line to cut off such an arch from the Circle, whose Chorde shall be equall to the line C.



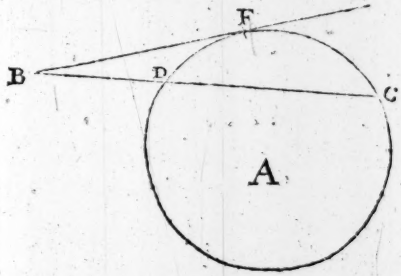
TAke with your Compasses the line C. and set it any where in the Circomference, viz, from D. to E. then drawe the line D E. at length to F. that done, from B. drawe a line to the Center G. then keeping one foot in G. with the other (at the distance G B) make the arch B F. to cut D E. being drawne forth in F. That done, take F D. and setting one foot in B. with the other eroise the Circle in H. Lastly, drawe the line B I H. which cutteth off the Arch I K H. whose Chord

Chord I H. is equall to C. the line giuen which was required.

Prob. XXXIII.

From a point without a Circle to drawe a line, cutting off an arch in such sort, that the Chorde of the arch cut off shall be a meane proportion, betweene the whole line drawne from the point to the further side of the Circomference, and the part of that line from the point to the neereſt side of the Circomference: wherein is to be noted, that the point without, muſt be so placed, that a touch line drawne from it to the Circle, may not exceed the Diameter of the Circle.

Let A, be a Circle giuen, and let B. be a point assigned, from whence it is required, to drawe a line as B C. in such sort that C D. shall be a meane proportion betweene B D and B C.



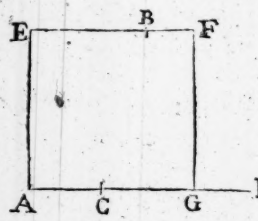
FIrſt, from the point B. drawe by the 21. proposition a touch line to the Circle, as B F. which toucheth in the point F. That done, count B F. 36.3.

the greater ſegement of a line deuided by extreame and meane proportion, and then by the 28. propoſition finde the whole line, which take, and ſetting one foot in B. with the other croſſe the Circle in C. Laſtly, drawe the line B C. which performeth your deſire.

Prob. XXXIIII.

To make a Geometricall ſquare to paſſe by any three points giuen.

Let A B C. be three points giuen, and let it be required to make a ſquare to paſſe by them.



FIrſt by the points A C. drawe a line at length, as A D. that done, by the point B. drawe a Parralell to A D. as E F. then from A. let fall a Perpendicular to E F. as A E. which diſtance ſet vpon the Parralell E F. from E to F. ſet it alſo from A, to G. and drawe F G. ſo ſhall you include the Square A E F G which ſhall paſſe by the three points A B C. required.

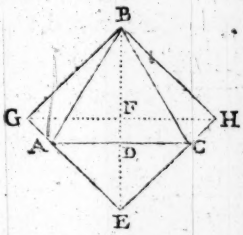
31.1.
12.1.

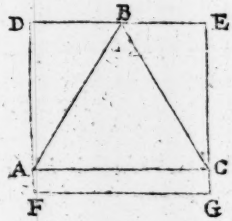
This is not ſo eaſie if the points giuen, make an equilaterall Triangle: wherefore I will ſhew you how it

it may then be done, (which is diuers waies) where-of I will set two of the best.

Another way.

Againe, let A B C, be three points giuen, by which a Geometricall Square is to passe.





FIrst drawe the lines A B. B C. and C A. inclosing the Equilaterall Triangle A B C. then from the point B. let fall a perpendicular as B D. which increase to E. so that D E. may be equall to D C. or D A. (the $\frac{1}{2}$ of the side A C.) That done, deuide the whole line B E. into two equall parts at right angles in F. by the line G H. then set alwaies $\frac{1}{2}$ B E. from F. to G. and to H. Lastly, drawe the lines B H. H E. E G. and G B so shall you include a square that shall passe by the points A B C, required.

Another way.

Againe, in the second figure of the last Diagram, on your right hand, let A B C. bee three points giuen,

giuen, by which it is required to make passe a Geometricall square.

FIrst, drawe lines from point to point, making the Triangle A B C. That done, by B. drawe a Parrallell to A C. as D E. Then from A. let fall a Perpendicular vpon the said D E, as A D. which increase downeward to F. then set the distance A C. from D. to F. and therewith make the square D E G F. which shall passe by the three points A B C. required.

Prob. XXXV.

To make a Triangle, like a Triangle giuen, with all his angles, whose base shall be equall to a line giuen.

Let A B C. be a triangle giuen, and let D E, be a line giuen, Now it is required to make another triangle like the triangle A B C. whose base shall be equall to the line D E.

BY the seauenth proposition from the end D. protract an angle equall to the angle A. as E D F. then from the end E. protract an angle equall to the angle B. as

B. as D E F. which ſhall incloſe the triangle D E F. like A B C. vpon the baſe D E. which was required.

Prob. XXXVI.

IN the Diagram following there is a Triangle as A B C. now there is drawne a line at pleaſure, as C D making the angle A C D, And it is required from A. to drawe a line to ſome part of C D. as A D. (in ſuch ſort) that the triangle A C D. may be equall to the giuen triangle A B C.

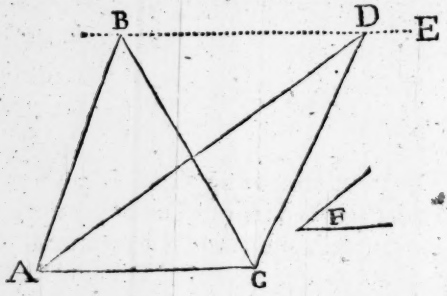
BY the point B. drawe a Parralell to the baſe A C. as B D. to cut C D. in D. Then drawe from the angle A. a line to the point D. (as A D) ſo ſhall you include the triangle A C D. equall to the triangle A B C. which was required.

Prob. XXXVII.

To reduce a Triangle into another Triangle, hauing the ſame baſe but other angles.

Let A B C. be a triangle giuen, and it is required to reduce the ſame into another triangle, hauing the ſame baſe but any other angles.

A C. 25. Perp. from B. to A C. 28. Perp. from D. to A C. also 28.



BY the second way of the 6. Proposition drawe from the point B. a Parralell to the base A C. as B D E. Then from A. the one end of the base, drawe a line to any point in that Parralell, as the line A D. (to the point D.) Lastly, from the other end C. drawe to the same point D. the line C D. so shall the triangle A C D. be equall to the triangle A B C. hauing the same base, viz. A C. but other angles which was required.

Prob. XXXVIII.

A Triangle being giuen, to make another equall thereunto vpon the same base, and hauing an angle equall to an angle giuen.

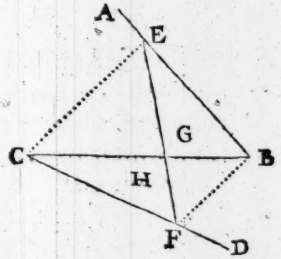
Let in the last Diagram, A B C, be a triangle giuen, and it is required to make another equall thereunto vpon the same base, but hauing one angle equall to the angle F.

First,

FIrſt by the top B. drawe a Parralell to the baſe AC. by the ſecond way of the ſixt Propoſition as B E. Then by the ſeauenth propoſition from the point A. make the angle C A D, equall to the angle F. and drawe the line A D. till it touch the Parralell B E in D. Laſtly, drawe the line C D. ſo ſhall you include the triangle A D C. equall to the triangle A B C. vpon the ſame baſe A C. hauing one angle (as C A D) equall to the angle F. required.

PROB. XXXIX.

Let A B. B C. and C D. be three lines giuen, making the two angles A B C. and B C D. and let E. be a point aſſigned, from whence it is required to drawe a line as E F. in ſuch ſort that the triangle G. may be equall to the triangle H.



FIrſt from the point E. drawe an obſcure line to C. as the pricked line E C. then by the 6. propoſition from B. drawe a Parralell thereunto as B F. which

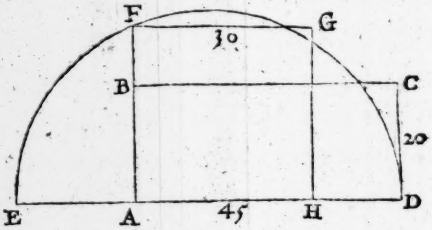
cutteth C D. in F. Lastly, drawe the line E F. which performeth the desire.

These foure last Prob. haue their demonstration out of the 37. 1. *of* Euclid.

Prob. XL.

To reduce a long square into a Geometricall square.

Let A B C D. be a long square giuen, to be reduced into a Geometricall square.



BY the 26. proposition finde a meane proportion, between the length and the breadth, which meane proportion is A F. whereof make the square AFGH. by the 13. proposition, which shall be equall to the long square A B C D. required.

Prob. XLI.

To reduce a Rombus into a Square.

FRom one of the obtuse angles, let fall a Perpendicular, to the base. Then finde a meane proportion betweene

betweene that perpendicular and the baſe, and that ſhall be the ſide of a ſquare equall thereunto.

Prob. XLII.

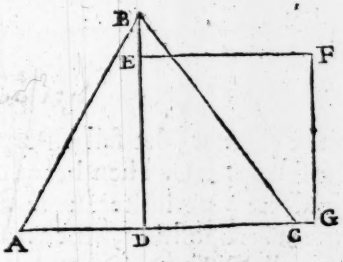
To reduce a Romboides into a Square.

FRom one of the obtuſe angles, let fall a perpendicular vpon the baſe (which muſt be one of the longeſt ſides) Then betweene that perpendicular and the ſaid baſe, finde a meane proportion, which ſhall be the ſide of a ſquare equall thereunto.

Prob. XLIII.

To reduce a Triangle into a Square.

Let A B C. be a triangle giuen, to be reduced into a ſquare.



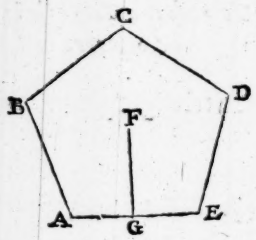
FIrſt from the angle B. let fall a perpendicular to the baſe A C. as B D. Then by the 26. propoſition

finde a meane proportion betweene the ſaid Perpendicular and the halfe baſe, which will be D E. whereof make the ſquare D E F G. which ſhall be eqaall to the triangle required.

Prob. XLIIII.

To reduce a Poligon conſiſting of equall ſides and angles into a Square.

Let A B C D E. be a Poligon giuen, of fiue equall ſides and angles (more properly called a Pentagon) to be reduced into a ſquare.



Firſt from the Center, let fall a Perpendicular to one of the ſides as F G. Then betweene that Perpendicular and the $\frac{1}{2}$ perimiter, finde a meane proportion by the 26. propoſition, which ſhall be the ſide of a ſquare equall thereunto.

Theſe fiue laſt Prob. haue their demonſtration out of the 14. of the 2. of Euclid.

Prob. XLV.

From a point in any side increased of a Triangle giuen, to drawe a line to the opposite side, through the side next the point, to include a Triangle equall to the Triangle giuen.

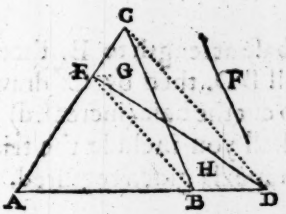
Let in the Diagram following A B C. be a triangle giuen, whose base A B. runneth forth to D. Now it is required from D. to drawe a line to some part of the side A C. in such sort that so much as it cutteth off so much it may take in.

FRom the point D. to C. drawe an obscure line as D C. then by B. drawe a Parralell thereunto, to cut A C. in E. Lastly, drawe D E. which shall cut off the triangle G. and take in the triangle H. equall thereunto.

Prob. XLVI.

A Triangle being giuen, to make another equall thereunto, whose base or Perpendicular, is limmited.

Let A B C, be a triangle giuen, and it is required to make another equall thereunto, whose perpendicular shall be equall to the line F.

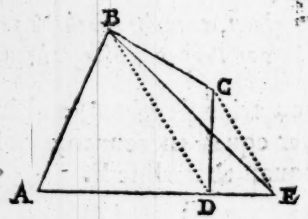


AT the distance of the line F. drawe a Parralell to the base A D. which cutteth the side A C. in E. Then increase the base AB. at length to D. That done, drawe E B. then by the point C. drawe a parralell thereunto as CD. to cut the base being increast in D. Lastly, drawe E D. so shall you include the triangle A E D. equall to A C B. (for there is cut off the triangle G. and taken in the triangle H. equall thereunto.

Pros. XLVII.

To reduce a Trapezia into a triangle

Let A B C D. be a Trapezia giuen, to be reduced into a Triangle.

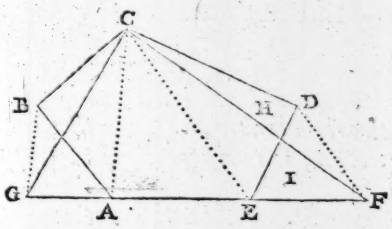


INcrease the base at length to E. that done, drawe the Diagonall B D. then by C. drawe a Parralell thereunto, to cut the base (increased) in E. Lastly, drawe B E. so shall you include the triangle A B E. equall to the Trapezia giuen required.

Prob. XLVIII.

From an angle in a plot giuen, to drawe a line to the baſe, increaſed (if ſo it require) that ſhall take in ſo-much as it cuts off.

Let A B C D E. be a plot giuen, and it is required to drawe a line from the angle C. in ſuch ſort, that the triangle H. cut off, be equall to the triangle I. taken in.



FIrſt increaſe the baſe that way as the line from C. is to be drawne, viz. to F. Then drawe the obſcure line C E. that done, from the point D. drawe a Parralell thereunto, to cut the baſe (being increaſed) in F. Laſtly, drawe C F. which performeth the demaund.

Againe, let it be required from C. to drawe a line towards the left hand, as C G. in ſuch ſort, that ſo much as is cut off may be taken in. Increaſe the baſe E A. to G. then drawe C A. that done, by the point B. drawe a Parralell thereunto as B G. to cut E A. (increaſed) in G. Laſtly, drawe the line C G. which ſhall take in ſo much as it ſhall cut off.

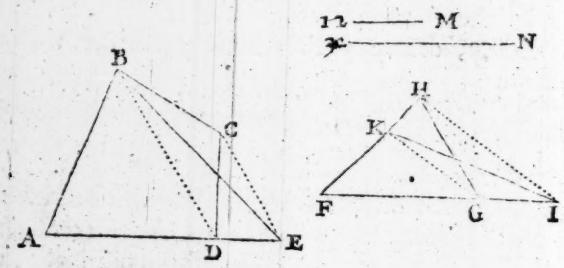
Note. Heereby may be gathered, how to reduce a plot into a triangle, with lines drawne from an angle assigned: for let the base be first increased both waies, Then drawe C F. as before taught, cutting off the triangle H. and taking in the triangle I. equall therunto, (so is there nothing lost) For the Trapezia A B C F. is equall to the plot A B C D E. Againe, (by the same rule) let C G. be drawne, taking in so much as it cutteth off, so shall the triangle C G F, be equall to the Trapezia A B C F. or vnto the plot A B C D E. required.

These 4. last Prob. haue their demonstration out of the 37. *of the* 1. *of* Euclid.

Prob. XLIX.

To giue two right lines in such proportion, one to the other, as two figures giuen.

Let the Trapezia A B C D. and the triangle F G H. be two figures giuen, and it is required to giue two right lines in proportion as the triangle to the Trapezia.



Fl. 45. p. 12
FG. 30. p. 18

AE. 45.
Per. from B.
32.

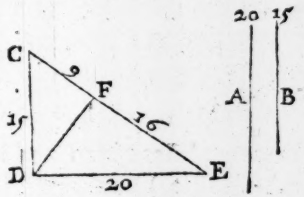
By

BY the 47. probleme bring the Trapezia into the triangle ABE. Then increaſe the baſe of the triangle F G. to I. till it be of the length of AE. (the baſe to the rtiangle ABE) Then by the 46. probleme, bring the triangle FGH. into the triangle FKI. whoſe baſe FI is equall to A E. (the baſe to A B E.) That done, take the perpendicular or ſhorteſt diſtance of the triangle FKI. from K. on the baſe F I. which is the line M. 37. 1. Likewiſe, the perpendicular or ſhorteſt diſtance (in 1. 6. the triangle A B E) from B. to the baſe A E. which is the line N. ſo ſhall the line M. haue the ſame proportion to the line N. as the triangle F G H. to the Trapezia, ABCD. which was required.

Prob. L.

To giue two right lines, hauing ſuch proportion one to the other, as two ſquares giuen.

Let A. and B. be the ſides of two ſquares giuen, and it is required to giue two right lines, hauing the ſame proportion one to the other, as the ſquare made of the line A. hath to the ſquare made of the line B.



IOyne the lines A and B. ſo together, that they make a right angle, as C D E. and drawe the ſubtendant ſide C E, Then from the right angle D. let fall a perpendicular to C E. (as D F) which deuideth C E into two parts in F. which partes C F and E F. are two right lines in proportion one to the other, as the ſquare of A. to the ſquare of B. For as C F. to E F. ſo the ſquare of A. to the ſquare of B. which was required.

8. 6.
4. 6.
Cor. 19. 6.

And not only 2. right lines may this way be giuen, hauing proportion together as 2. ſquares, but as 2. Circles, trianglts, or other figures, whoſe angles are alike, and ſides proportionall, as if A. and B. were the Diameters of 2. Circles, then the lines C F. and E F. haue the ſame proportion one to the other as thoſe Circles.

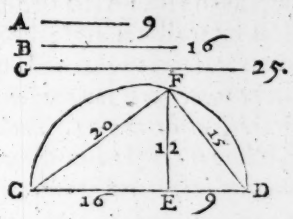
Againe, let A. and B. be 2. ſides of 2. equiangled triangles, Then their Contents are as C F. to E F. and the like of 2. *Pentagons, Hexagons, Heptagons, &c.*

Prob. LI.

To make any two like figures, hauing proportion one to the other, as two lines giuen.

Let A. and B. be two lines giuen, and it is required, to make (two like triangles) hauing the ſame proportion together, as the line A. to the line B.

Ioyne



IOyne the lines A. and B. ſo together that they make one line as C D. whereupon deſcribe the ſemi-circle, C F D. Then vpon the point E. where the lines are ioyned together, erect a perpendicular to cut the lymbe in F. as E F. Laſtly, drawe the lines D F and C F. which ſhall be the ſides of the triangles required. For an equilaterall triangle, made of the line D F. ſhall haue the ſame proportion, to an equilaterall triangle made of the line C F. as the line A. to the line B. which was required. Cor, 19. 6. 8. 6. 4. 6.

Or thus.

Againe, in the ſame Diagram, let A. and G. be two lines giuen, and it is required to giue the ſides of two equilaterall triangles, which ſhall haue the ſame proportion together as the line A. to the line G.

FIrſt, lay downe the line G. from C. to D. whereupon deſcribe the ſemi-circle C F D. Then take the line A. and ſet it from D. to E. and vpon the point E. erect a perpendicular to cut the lymbe in F. Laſtly, drawe D F. ſo ſhall D F. and D C. be the ſides of two Equilaterall triangles, hauing the ſame proportion

one to the other, as the line A. to the line G. For as A to G. ſo an Equilaterall triangle made of the line DF. to an Equilaterall triangle made of the line DC.

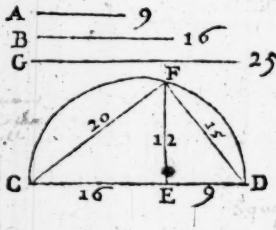
And in the ſame manner may you doe for Squares, Circles, or other like figures, as by the 91. Probleme doth more plainely appeare, where is taught how to increaſe or decreaſe a plot according to any proportion giuen.

But if your triangles to be made, bee not Equilaterall, Then, muſt you doe the like for euery of the ſides apart, or els, by the rule of proportion, (hauing thus found one of their like ſides) finde the reſt, &c.

Prob. LII.

To deuide a line in power according to any proportion giuen.

Let CD. be a line giuen, to be deuided in power as A. to B.



BY the 24. probleme deuide CD. in E. as A. to B. viz. that as A. to B. ſo the leſſer part DE. to the greater part EC. That done, deſcribe vpon the line CD. the ſemi-circle CFD. then vpon the point E. erect

E. erect a perpendicular to cut the lymbe in F. Lastly, drawe the lines D F. and C F. which together in power shall be equall to the power of the giuen line CD, and yet in power one to another, as A. to B. which was required. 31.3. 47.1. 8.6. 4.6. 2 Cor. 20.6

Prob. LIII.

To inlarge a line in power according to any proportion assigned.

Let (in the last Diagram) CE. be a line giuen, to be inlarged in power as B. to G.

By the 23. probleme, say if B. giue G. what CE? answere CD. whereupon describe the semi-circle C F D. that done, vpon the point E. erect a Perpendicular to cut the lymbe in F. Lastly, drawe C F. which shall be in power to C E. as G. to B. which was required.

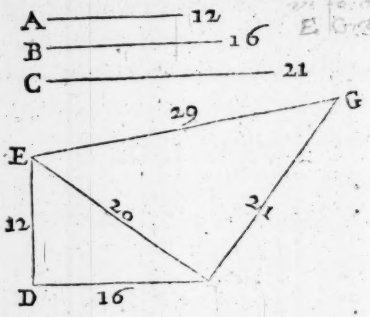
The demonstration heereof may be gathered from the places of Euclid *set downe by the last Probleme.*

Prob. LIIII.

To adde 2. 3. or more Squares together in one.

Let A B. and C. be the sides of three squares giuen, and it is required to adde them altogether in one, that is to finde the side of one square, which shall be equall to them all.

Of



OF the two ſides A. and B. make a right angle as the angle E D F. then drawe the ſubtendant ſide E F. which ſhall be the ſide of a ſquare equall to both the ſquares made of the lines A. and B. together. That done, vpon the end F. (of the line EF) 47. 1. erect a perpendicular of the length of the line C. as F G. Then drawe E G. which ſhall be the ſide of a ſquare equall to three ſquares whoſe ſides are the lines A. B. C. required.

And in the ſame manner may you adde Circles, like Triangles, and other like figures together, as appeareth by the 31. Prop. of the 6. of Euclid.

Prob. LV.

To ſubſtract one ſquare from another.

In the laſt Diagram, let it be required to ſubſtract the

the ſquare of the line A. from the ſquare of the line C.

FIrſt make a right angle at pleaſure (as the angle E DF.) then ſet the line A. from D. to E. that done take the line C. with your Compaſſes, and letting one foot in F. with the other croſſe the line D E. in E. ſo ſhall D E. be the ſide of a ſquare remaining, when the ſquare of A. is taken from the ſquare of C. which was required. 47. 1.

Prob. LVI.

Within a Circle giuen, to inſcribe a Square.

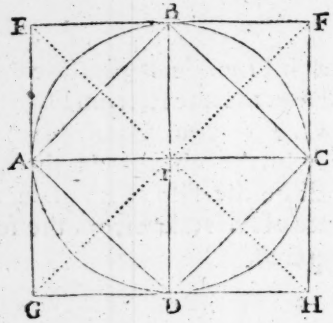
Let in the Diagram following A B C D. be a circle giuen, wherein a ſquare is to be inſcribed, &c.

DRawe through the Center the Diameter A C. which croſſe at right angles, with B D. then drawe the lines A B. B C. C D. and D A. ſo ſhall you inſcribe a ſquare within a Circle, which was required. 6. 4

Prob. LVII.

About a Circle giuen, to deſcribe a ſquare.

Let A B C D. be a Circle giuen, about the which it is required, to deſcribe a ſquare.



FIrſt drawe the two Diameters A C. and B D. croſſing one another at right angles, which cut the Circle in the points A B C D. then by the points
7.4. B. and D. drawe Parralells to A C. alſo, by A. and C. parralells to B D. which foure lines meeting in the points E F G H. ſhall make the ſquare required.

PROB. LVIII.

To inſcribe a Circle within a Square.

Let in the ſame Diagram, E F H G. bee a ſquare giuen, and it is required to inſcribe a Circle within it.

DRawe the Diagonals E H. and F G. which cut one the other in I. which is the Center, From whence
8.4. let fall a perpendicular to one of the ſides of the ſquare, as I D. with which diſtance ſetting one foote

in

in the Center, make the circle A B C D. which ſhall ſtand within the ſquare giuen E F H G. as was required.

Prob. LIX

To circomſcribe a Circle about a ſquare.

Let in the 57. Probleme A B C D. be a ſquare giuen, about which a Circle is to be made.

DRawe the Diagonnals AC. & BD. which cut one another in I. which ſhall be the Center. Therefore ſet one foot in I. and extend the other to any of the points A. B. C. D. and make the Circle A B C D. which ſhall compaſſe the ginen ſquare required. 9. 4.

Prob. LX.

About a Triangle, to deſcribe a Circle.

Let A B C. be a Triangle giuen, about the which it is required to make a Circle.

SVppoſe the 3. corners A B C. to bee 3. points giuen, then by the 10. probleme being thoſe 3. points into one Circomference, ſo ſhall you make the Circle A B C. to include the triangle required.

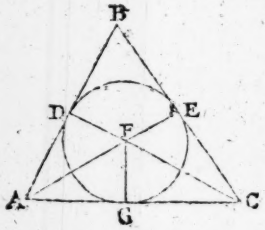
Or (which is all one) deuide any 2. ſides of the triangle into 2. equall parts at right angles by the firſt probleme, as the ſide A B. with the line D. and B C. with the line E. (if they were drawne forth.) Which 2. lines meet in the point F. which ſhall be the Center, then ſet one foot in F. and extend the other to any of the angles A B C. and make the circle A B C. which ſhall include the triangle A B C. required.

5.4.

Prob. LXI.

Within a Triangle giuen, to inſcribe a Circle.

Let A B C. be a triangle giuen, wherein a circle is to be inſcribed.



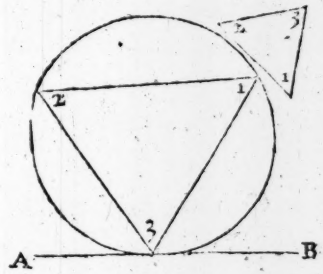
By

BY the eight Probleme deuide any two of the angles into two equall parts, as the angle A C B. with the line C D. and the angle B A C. with the line A E. which two lines meet in F. ſo is F. the Center, from whence let fall a perpendicular to any of the ſides (as F G) vpon the ſide A C. with which diſtance make the circle D E G. vpon the Center F. which ſhall ſtand within the giuen triangle A B C. required. 44.

Prob. LXII.

To inſcribe within a Circle, a Triangle, whoſe ſides ſhall be in proportion one to the other, as the ſide of a Triangle giuen.

Let 1. 2. 3. be a circle giuen, wherein it is required to inſcribe a triangle, whoſe ſides ſhall haue proportion together as the ſides of the little triangle 1. 2. 3. &c.



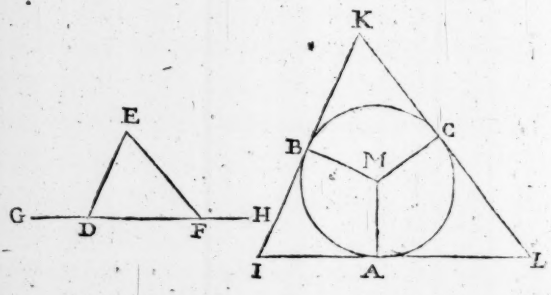
DRawe by the 21. Probleme a touch line, as A. 3. B which toucheth the circle in the point 3. Then make the angle A. 3. 2. equall to the angle 1. of

the little triangle, and the angle 1. 3. B. equall to the angle 2. of the same little triangle by the 7. Probleme. Lastly, drawe in the circle the line 2. 1. so shall you inscribe the triangle 1. 2. 3. within the circle, whose
2.4. sides shall be in proportion one to the other, as the sides of the lesser triangle 1. 2. 3. which was required.

Prob. LXIII.

About a Circle giuen, to discribe a triangle, whose sides shall haue proportion one to the other, as the sides of a triangle giuen.

Let A B C. be a circle giuen, about the which it is required to describe a triangle, whose sides shall be in proportion one to another, as the sides of the triangle D E F.

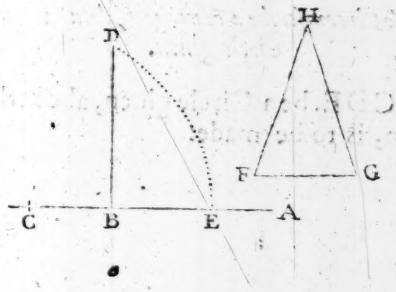


INcrease the base D E. on both sides, to G. and to H. making the angles E D G. and E F H. That done, from M. the center of the circle, drawe a line to any part of the circomference, (as M A.) Then make the

the angle A M B. equall to the angle E D G. alſo, the angle A M C. equall to the angle E F H. That done, vpon the points A. B. C. erect perpendiculars, which will meet in the points K. L. I. ſo ſhall the ſides of the triangle K L I. haue proportion together, as the ſides of the giuen triangle D E F. which was required. 3. 4.

Prob. LXIIII.

To make ſuch an Iſoſceles Triangle, that ſhall haue each angle at the baſe, double to that at the toppe.



BY the 27. propoſition deuide any line, by etxream and meane proportion, as the line A B. in E. ſo is B E. the greater ſegement. Then make an *Iſoſceles* triangle, whoſe baſe let be the ſaid greater ſegement, and the other ſides, each the whole line A B. as F G H. which ſhall be the triangle required. 10. 4.

Prop. LXV.

Prob. LXV.

Within a Circle giuen, to inscribe a Pentagon.

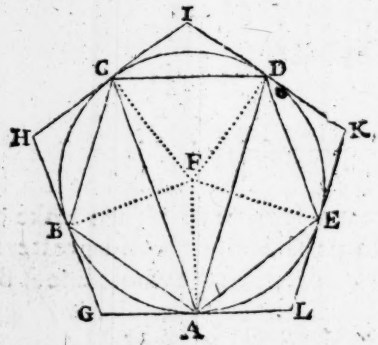
Let in the Diagram following ABCDE. bee a circle giuen, wherein a pentagon, is to be inscribed.

BY the last Probleme make such an *Isosceles* triangle as was there taught, hauing each angle at the base, double to that of the toppe. Then by the 62. Pro-
11.4. bleme inscribe within the circle giuen a triangle, like that, as the triangle ACD. whose base CD. set fiue times in the lymbe, so shall you include the Pentagon ABCDE. within the circle which was required.

Prob. LXVI.

To Circumscribe a Pentagon, about a Circle giuen.

Let ABCDE. be a Circle giuen, about the which a Pentagon, is to be made:



First

FIrſt, inſcribe the Pentagon, A B C D E. as before taught, then from the center F, drawe lines to euery of the points A. B. C. D. E. That done, vpon euery of thoſe lines, on the points A B C D E. 12.4. erect perpendiculars, which will meet in the points G H I K L. which ſhall include a Pentagon, about the circle which was required.

Prob. LXVII.

Within a Pentagon giuen, to inſcribe a Circle.

Let in the laſt Diagram G H I K L. be a Pentagon giuen, within the which a circle is to be inſcribed.

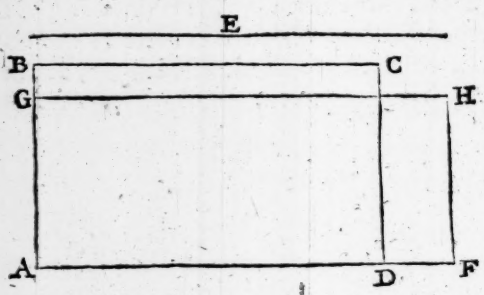
DEuide any two of the ſides in the mydſt, at right angles, as the ſide I K. with the line D F. and the ſide G L. with the line A F. which meet in F. ſo is F. the center. Then ſetting one foot in F. 13.4. extend the other to one of the points A. or D. and make the circle A B C D E. which ſhall ſtand within the Pentagon G H I K L. required.

Prob. LXVIII.

To reduce a long ſquare into another long ſquare whoſe length or breadth is limmited.

Let A B C D. be a long ſquare giuen, to be r-

ced into another long ſquare, whoſe length ſhall be equall to the line E.



E. 48.
AB. 24.
BC. 40.
FH. 20.

INcreaſe AD. to F. then ſet the line E. from A. to F. That done, by the 23 Probleme, ſay if E. giue the length BC. what the breadth AB. anſwere AG. for the breadth (of the long ſquare to be made) and AE. or E. is the length, whereof make the long ſquare AGHF. which ſhall be equall to the long ſquare AC. and yet his length AF. equall to the giuen line E. which was required.

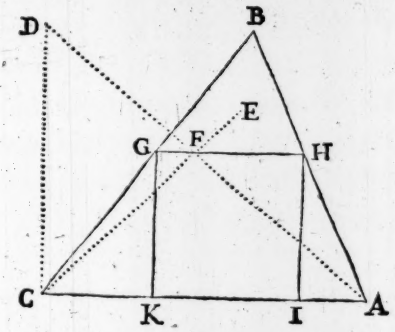
P. 23.

PROB. LXIX.

Within a Triangle, to inſcribe a Square.

Let ABC. be a triangle giuen, wherein a ſquare is to be inſcribed.

Vpon



AB.169.
AC.182.
CB.195.
GH.84.

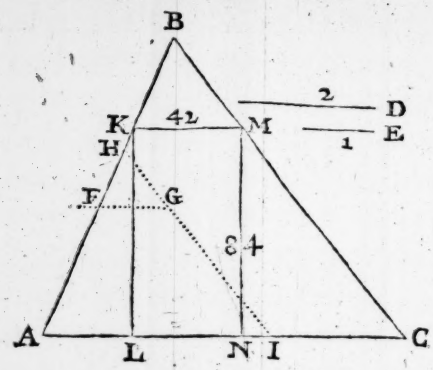
VPon the end C. erect a prerpendicular of the length of the perpendicular, from B. vpon the base A C. (as C D) then drawe the subtendant side A D. That done, deuide the right angle A C D. into two equall parts (by the 8. Probleme) with the line C E. which cutteth A D. in F. Lastly, by the point F. drawe a Parralell to the base A C. as G H. whereof make the square G H I K. which shall stand within the triangle A B C. required. 32. 1. 6. 1. 12. 6.

Prob. LXX.

Within a Triangle, to inscribe a Parralellogram, whose sides shall haue proportion together, as two lines giuen.

Let A B C. be a triangle giuen, and let it be required to inscribe within it a long square, whose length shall haue proportion to his breadth as the line D. to the line E.

AB. 130.
AC. 140.
CB. 150.
BM. 45.



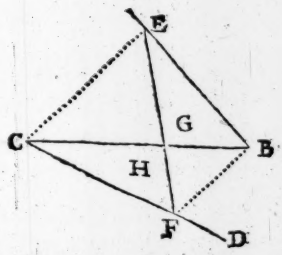
AT the distance of the length D drawe a Parralell to the base A C, as F G. to cut the side A B. in F. then set the breadth E. on the parralell from F. to G. and by G. drawe a parralell to the side B C. as H I. to cut A B. in H. Then say by the 23. Probleme, if A H. giue A F. what A B? answere A K. from which point K. let fall a perpendicular to the base A C. as K L. also, from K. drawe a parralell to A C. as K M. to cut the side B C. in M. Lastly, from M. let fall a perpendicular to A C. as M N. so shall you include the long square L K M N. within the triangle A B C. whose length shall be to his breadth as the giuen lines D. to E. which was required.

4. 6.
12. 6.

Prob. LXXI.

There is an angle B C D. and from a point as F. in the line C D. is drawne a line by chance of any length as F E. cutting off from the angle B C D. the triangle H. Now it is required from B. to drawe a line

line to some part of F E. as the line B E. to inclose a triangle as G. equall to the triangle H. cut off.



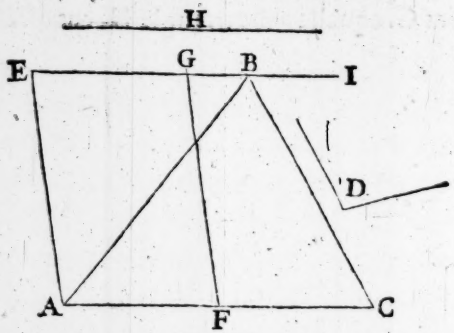
B F. 16. the parralels distance 29

DRawe from the end B. to the point F. a blinde line as B F. then from C. drawe a parralell thereunto as C E. to cut the line F E. in E. Lastly, 37. 1. drawe the line B E. so shall you inclose the triangle G. equall to the triangle H. cut off, which was required.

Prob. LXXII.

To make a Romboides equall to a Triangle giuen, hauing two opposite angles each equall to an angle giuen.

Let A B C. be a triangle giuen, and it is required to reduce the same into a Romboides, hauing two opposite angles each equall to the angle D.



A C. 36. p. frõ B. 28
A F. 18. p. frõ G. 28

FIrst, by the point B. drawe a parralell to the base A C. as E B I. then from the end A. protract an angle equall to the giuen angle D. as C A E. and drawe A E. till it touch that parralell in E. that done, take $\frac{1}{2}$ the base A C. which is A F. and set it in the
42.I. same Parralell from E. to G. Lastly, drawe F G. so shall you inclose the Romboides A E G F. equall to the triangle A B C. and hauing two opposite angles E. and F. each equall to the angle D. which was required.

Prob. LXXIII.

To reduce a Romboides into a Triangle.

Let in the last Diagram, A E G F. be a Romboides giuen, to be reduced into a triangle.

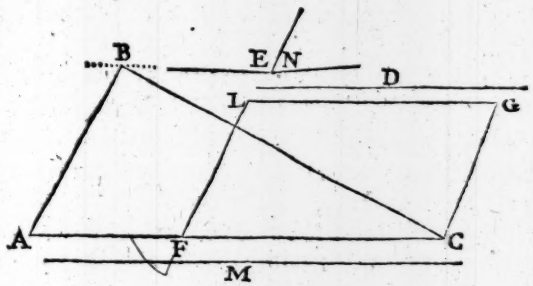
First,

FIrſt increaſe the ſides E G. and A F. to I. and to C. then ſet A F the breadth of the Romboides from F. to C. ſo that A C. may be twiſe A F. that done, take in the line E I. any point at pleaſure, as the point B. from whence drawe the lines B A. and B C. ſo ſhall you include the triangle A B C. equall to the Romboides A E G F. required. 41. 1.

PROB. LXXIIII.

To make a Romboides, whoſe length is limmited, equall to a Triangle giuen, and alſo, hauing two oppoſite angles each equall to an angle giuen,

Let A B C. be a triangle giuen, and let it be required to make a Romboides equall thereunto, whoſe length ſhall be as long as the line D. and hauing two oppoſite angles, each equall to the angle E.



A C, 48. p frō. B. 20. C F. 20. p frō. L. 16 D. 30. M. 48.

FIrſt, take the length D. and ſet it from C. to F. then from C. protract an angle equall to the angle E. as F C G. that done, ſay by the 23. Probleme if the line

line D. giue the perpendicular from B. to A C. what ½ the baſe A C. anſwere a line, at which diſtance draw a parralell to A C. as G L. (of the length of C F.)
P. 7. Laſtly, drawe F L. ſo ſhall you include the Romboi-
P. 1. des C G L F. whoſe length C F. ſhall be equall to the
P. 23. giuen line D. and his oppoſite angles C. and L. each
P. 5. equall to the angle E. which was required.

Prob. LXXV.

A Romboides being made by chance, it is required to make a triangle equall thereunto, whoſe baſe ſhall be equall to a line giuen, and hauing an angle equall to an angle giuen.

Let in the laſt Diagram, the Romboides C F L G. be giuen, and it is required to make a triangle equall thereunto, whoſe baſe ſhall be of the length of the line M. and hauing one angle equall to the angle N.

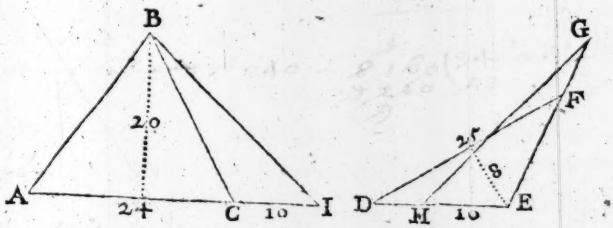
FIrſt increaſe the ſide C F. to A. then ſet the line M. from C. to A. for the baſe, that done, from A. protract an angle equall to the angle N. as the angle B A C. by drawing the line A B. Then ſay by the
P. 7. 23. Probleme, if the ½ baſe giue the perpendicular (of
P. 23. the Romboides) from L. vpon the ſide C F. what the length C F? anſwere a line, at the diſtance whereof, drawe a parralell to the baſe A C. as the pricked line B. to cut A B. in B. Laſtly, drawe the line B C. ſo ſhall you include the triangle A B C. equall to the Romboides C F L G. and hauing an angle as the angle B A C. equall to the giuen angle N. which was required

Prob. LXXVI.

Prob. LXXVI.

To adde two ſeuerall Triangles together, and to make one of them both, whoſe perpendicular ſhall be equall to the perpendicular of one of the giuen Triangles.

Let A B C. and D E F. be two triangles giuen, and it is required to make one equall to them both, whoſe perpendicular ſhall be the perpendicular of the triangle A B C.



BY the 46. Probleme, reduce the triangle D E F. into another triangle whoſe perpendicular may be equall to the perpendicular of the triangle A B C. (as into the triangle G E H.) that done, increaſe the baſe of the triangle A B C, viz. A C. to I. then take E H. the baſe of the triangle G E H. and ſet it from C. to I. Laſtly, drawe the line, B I. ſo ſhall you include the triangle A B I. which ſhall be equall to both the triangles A B C. and D E F. together, and hauing the perpendicular of the triangle A B C. which was required. 37. 1. 1. 6.

Prob. LXXVII.

To ſubſtract one Triangle from another, and to make the Triangle left, to haue the perpendicular of one of the giuen Triangles.

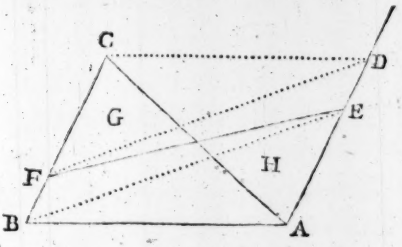
Let in the laſt Diagram A B I. and D E F, be two triangles giuen, and it is required to ſubſtract the tri-
37.1. angle D E F. from the triangle A B I. and to make the
1.6. triangle left, to haue the perpendicular of the triangle A B I.

BY the 46. Probleme, being the triangle D E F. into another triangle, whoſe perpendicular may be equall to the perpendicular of the triangle A B I. (from B. on his baſe A I.) as into the triangle G E H. whoſe baſe is E H. which take and ſet from I. to C. (vpon the the baſe A I) then drawe the line B C. ſo ſhall remaine the triangle A B C. hauing the perpendicular of the giuen triangle A B I. which was required.

Prob. LXXVIII.

There is a triangle as A B C. and from A is drawne a right line as A E D. Now from the point E. in that line, it is required to drawe a line through A C. (as E F) in ſuch ſort that the triangle G. cut off, be equall to the triangle H. taken in.

First

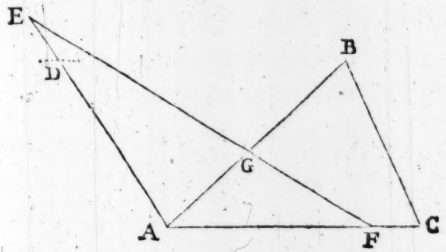


AB. 30. p.frō C. 2. p.frō C.20.

FIrſt by C. drawe a Parralell to the baſe A B. (as CD) to cut the line A E D. in D. that done, drawe the pricked line B E. then from the point D. draw a parralell thereunto to cut the ſide C B. in F. Laſtly, drawe the line F E. which performeth the demaund. 37. I.

PROB. LXXIX.

There is a triangle as A B C. and from the end A. there runnes a right line, as A D E. Now it is required from E to drawe a line to ſome part of the baſe A C. (as E F.) in ſuch ſort that the triangle A E G. may be equall to the Trapezia B C F G.

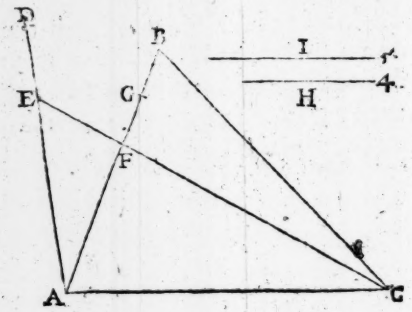


AC, 30. p.frō B. 20 AF. 24. p.frō E. 25

FIrſt drawe the pricked line E C. then by B. drawe a parralell to the baſe A C. to cut the line A E. in D. that done, by D. drawe a parralell to E C. to cut the
37. 1. baſe A C. in F. Laſtly, drawe the line E F. ſo ſhall the triangle A E G. be equall to the Trapezia B C F G. required.

Prob. LXXX.

There is a triangle as A B C, & from A. runneth a line as A D. now it is required from the angle C. to drawe a line to ſome part of A D. (as C E.) in ſuch ſort that the triangle A F C. cut off, together with the triangle AEF. taken in, (viz the whole triangle CAE) may haue proportion to the triangle giuen, as the line H. to the line I.



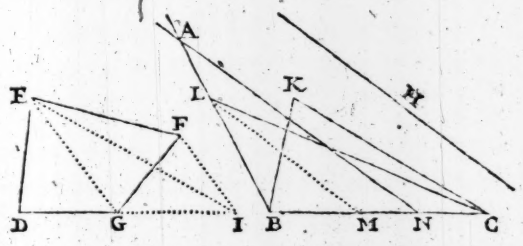
A B. 40
P. frō C 45
A C. 48
P. frō E. 30.
A G 32.
P. frō C. 45

BY the 23. Probleme ſay, if I. giue H. what A B? anſwer A G. then by G. drawe a parralell to
12. 6. the baſe A C. to cut the line A D. in E. Laſtly,
37. 1. drawe C E. ſo ſhall you include the triangle C A E. which performeth your deſire.

Prob. LXXXI.

Prob. LXXXI.

There is an angle as A B C. from the which it is required to cut off a part, equall to the Trapezia D E F G with a parralell to the line H.



D I. 45.
p. frō E. 24
B C. 45.
p frō K. 24
p. frō L. 24
B N 30.
p. frō A. 36

First reduce the Trapezia by the 47. Probleme into the triangle D E I. which triangle set in the angle C B A. beginning at B. as appeareth by the triangle C B K. that done, by the 38. Probleme, reduce the triangle C B K. into the triangle C B L. hauing the same base C B. but the angle at B. equall to the giuen angle C B A. that done, by L. drawe a parralell to H. the line giuen, to cut B C. in M. then finde a meane proportion, betweene B M. and B C. as B N. Lastly, by N. drawe a parralell to H. as N A. to cut the side B L A. in A. so shall you cut off from the angle A B C. the triangle A B N. equall to the Trapezia D E F G. with a parralell to the giuen line H. as was required.

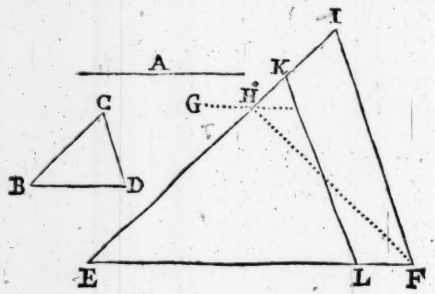
Prob. LXXXII.

A figure being giuen, to make an other in Area *equall thereunto, but like a figure giuen.*

Let the line A. be the side of some square giuen, and

let it be required to reduce the ſame into a triangle, like the triangle B C D. with all his angles, and ſides proportionall.

EF. 60. p. frō H 30. EL. 50. p. frō K, 36



FIrſt lay downe the diſtance of the line A. twiſe from E. to F. then at the diſtance of the line A. drawe a parralell to E F. as the pricked line G. That done, from the end E. protract an angle equall to the angle B. (of the giuen triangle B C D.) as the angle F E H. to cut the parralell G, in H. and drawe the pricked line H F. ſo ſhall the triangle E H F. be equall to that ſquare, whoſe ſide is the line A. that done, from the end F. protract an angle equall to the angle D. (of the leſſer triangle) as the angle E F I, to cut E H. being drawne forth in I. ſo ſhall the triangle E F I. be like the little triangle B C D. but more in *Area* then the triangle E H F (which is equall to the ſquare giuen) therefore to make one equall thereunto, Finde a meane proportion betweene E H. and E I. which is E K. then by K. drawe a parralell to I F. as K L. ſo ſhall the triangle E K L. be equall to that ſquare whoſe ſide is the line A. and hauing all his angles like the angles

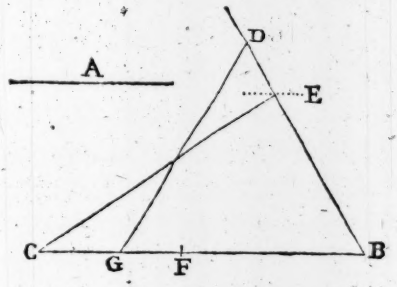
of

of the giuen triangle B C D. which was required.

PROB. LXXXIII.

To make an Equilaterall triangle, equall to a Square.

Let A. be the side of a square giuen, and it is required to make an Equilaterall triangle equall thereunto.



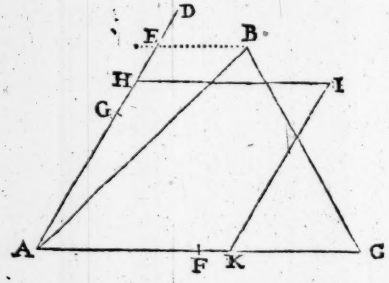
FIrst, drawe the line B C. iust of twise the length of the giuen line A. then from the end B. protract an angle equall to the angle of an equilateral triangle, as C B D. that done, at the distance of the line A. drawe a parralell to C B. as the pricked line E. to cut B D. in E. then set that distance B E. from B. to F. Lastly finde a meane proportion betweene B F. and B C. which is B G. which set from B to D. and drawe the line G D. so shall you include the Equilaterall triangle B D G. equall to C B E. or the square giuen, whose side is A. which was required.

PROB. LXXXIIII.

Prob. LXXXIIII.

To make a Rombus equall to a Triangle giuen.

Let A B C. be a triangle giuen, and it is required to make a Rombus equall thereunto.



FIrſt from the end A. protract an angle equall to one of the acute angles of the Rombus, which is the angle of an Equilaterall triangle (as the angle C A D.) then by the point B. drawe a parralell to the baſe A C. to cut A D. in E. that done, take alwaies ½ the baſe A C. (as A F.) and ſet that vpon the line A D. from A. to G. Laſtly, betweene A G and A E. finde a meane proportion, as A H. (for the ſide) wherof make the Rombus A H I K. which ſhall be equall to the giuen triangle A B C. required.

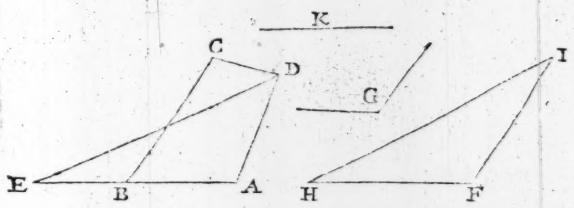
Theſe 4. laſt Problemes haue their demonſtration out of the 37. 1. *and the cor: of the* 19. 6. *of* Euclid.

Prob. LXXXV.

Prob. LXXXV.

To reduce a Trapezia into a Triangle, whose base is limmited, and yet shall haue an angle equall to an angle giuen.

Let A B C D. be a Trapezia giuen, and let it be required to make a triangle equall thereunto, whose base shall be the line H F. and hauing one angle, equall to the angle G.



E A 48. p fró D. 25 H F. 40. p. fró I. 30 K. 30.

First by the 47. Probleme, reduce the Trapezia into the triangle D A E. then from the end F. (of the giuen line H F.) protract an angle equall to the angle G. as the angle H F I. by drawing the line F I. that done, say by the 23. Probleme, if H F. giue E A. what the perpendicular from D. vpon the base E A. (being increased?) answer the line K. at which distance, drawe a blinde parralell to H F. to cut F I. in I. Lastly, drawe H I. so shall you include the triangle H F I. equall to the Trapezia A B C D. and hauing one angle equall to the giuen angle G. which was required.

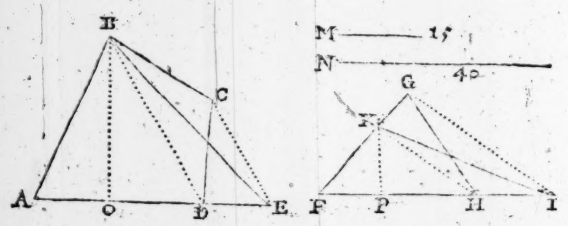
37.1. 23.1 12.6 31.1

Prob. LXXXVI.

Two figures being giuen, and a right line, to finde another line in proportion, to the line giuen, as the one figure to the other.

Let A B C D. and F G H. be two figures : also, let M. be a line giuen. Now it is required to finde another line in proportion to M. as the Trapezia ABCD. to the triangle F G H.

AE. 45.
p. BO. 32.
FH. 30.
p. f. ō G. 18
FI. 45.
p. KP. 12.



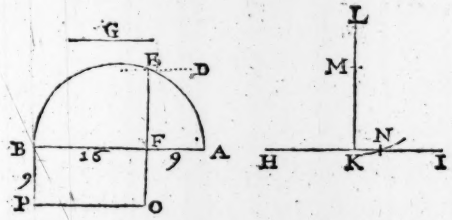
BY the 47. Probleme, bring the Trapezia ABCD. into the triangle A B E. whose base is A E. and let fall his perpendicular B O. Then reduce the triangle F G H. into another triangle, whose base may
37. 1. be equall to the said base AE. as into the triangle FKI.
1. 6. and let fall his perpendicular KP. so shall the triangle
12. 6. FKI. or F G H (because they are equall) bein proportion to the Trapezia as the perpendicular K P. to the perpendicular B O. Now if KP. were equall to the line M. then B O should be the line required, but for as much as it is not, therefore say by the 23. Probleme, if KP. were the line M. what B O? answer, the line N. and so is found that the line N. hath the same proportion

tion to the line M. as the Trapezia A B C D. to the triangle F G H. which was required.

Prob. LXXXVII.

To deuide a line giuen into two such parts, that another line (so it be not aboue halfe the giuen line) may be a meane proportion betweene the parts.

Let A B. be a line giuen, to be deuided into two such parts, that the line G. may be a meane proportion betweene those parts.



G. 12.

VPon the line AB. describe the semi-circle AEB. then at the distance of the line G. drawe a parralell to A B. as the pricked line D. to cut the Circomference in E. Lastly, let fall the perpendicular E F. which cutteth A B. into two parts in F. so is AF. and F B. the two parts required.

G. equall to E F. 13. 6.

Or thus:

Againe, in the same Diagram, let H I. be the line, & let it be so deuided, that the line G. may be a meane betweene the two parts.

DEuide HI in the midſt in K. & vpon K. erect a perpendicular at length, as KL. that done, ſet the line G. from K. to M. then take ½ H I. viz. H K, or K I. and ſetting one foot in M. with the other croſſe the line H I. in N. ſo ſhall I N. be the leſſer part, and N H. the greater.

PROB. LXXXVIII.

To reduce a ſquare into a long ſquare, whoſe length and breadth is limmited in a ſtraight line, wherein is to be noted, that the ſide of that ſquare may not exceed halfe the line giuen.

Let A B in the laſt Diagram be a line giuen, and let G. be the ſide of ſome ſquare. Now it is required to make a long ſquare equall to that ſquare whoſe ſide is the line G. and yet the length and breadth thereof together ſhall make but the line A B.

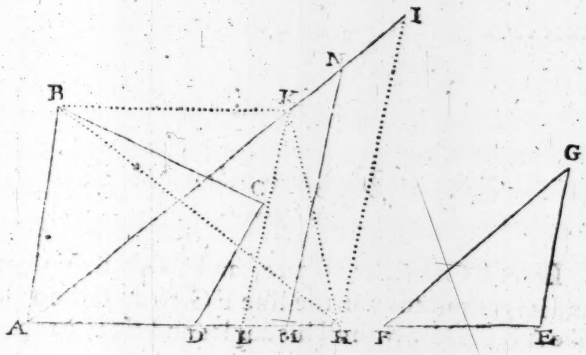
DEuide the line A B. as before taught in F. in ſuch ſort, that the line G. may be a meane proportion betweene the parts A F. and F B. ſo ſhall A F. be the breadth and F B. the length, whereof
47. 1. 13. 6. make the long ſquare B F O P. which ſhall be equall to that ſquare whoſe ſide is the line G. and yet the length B F. and the breadth F A. together, ſhall make but the giuen line A B. as was required.

PROB. LXXXIX.

Prob. LXXXIX.

To make a Triangle equall in Area, *to a figure giuen, and yet like a Triangle assigned.*

Let A B C D. be a figure giuen, and it is required to make a triangle equall thereunto, but like the triangle E F G.



A H, 36. p. frō B. 25
p. frō K 25
A L. 25.
A M. 30.
p. frō N. 30

BY the 47. Probleme bring the Trapezia A B C D. into the triangle A B H. then from the end A. protract (by the 7. Problem) an angle, as the angle H A I. equall to the angle F. of the giuen triangle, by drawing the line A I. Againe from the end H. (of the base A H.) protract an angle equall to the angle E. by drawing the line H I. (as the angle A H I) so shall you include the triangle A I H. like the giuen triangle E F G. but not equall to the Trapezia: for it is too big. Therefore from B. drawe a parralell to

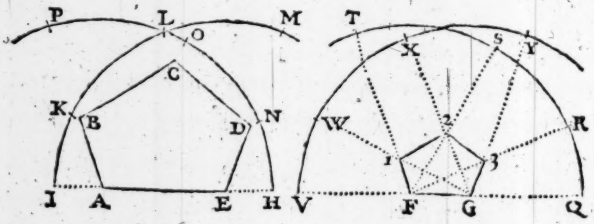
37. I.
23. I.
Cor. 19. 6

A H. as B K. to cut A I. in K. then drawe K H. ſo ſhall the triangle A K H. be equall to the triangle A B H. or the Trapezia A B C D. but that hath not the angle at H. equall to the angle E. of the giuen triangle: therefore drawe by the point K. a parralell to I H. as K L. to cut A H. in L. that done, betweene A L. and A H. finde a meane proportion which is A M. Laſtly, from the point M. drawe a parralell to H I. as M N. to cut the ſide A I. in N. ſo ſhall you include the triangle A N M. equall to the giuen Trapezia A B C D. and like the aſſigned triangle F E G. which was required.

Prob. XC.

Vpon a line giuen, to deſcribe a figure like a figure giuen.

Let A B C D E. be a figure, and F G. a line giuen, and it is required vpon the line F G. to deſcribe a plot like A B C D E. with all his angles and ſides proportionall.



First,

FIrſt extend the baſe A E. on both ſides at pleaſure, as to H. and to I. then ſetting one foot in E. make the arch I K L M. Set alſo one foot in A. and with the ſame diſtance make the arch H N O P. that done, lay the Rular by the angle A. and euery of the points E D C B. and marke the arch H N O P. in the points H N O P. Then lay alſo your Rular by the angle E. and euery of the points A. B. C. D. and marke the arch I K L M. in the points I K L M. Then, with the diſtance A H. or E I. ſetting one foot in F. make the arch Q R S T. Alſo, ſetting one foot in G. with the ſame diſtance make the arch V. W. X. Y. Then lay the Rular by the end F. (of the line F G.) and euery of the points R S T. and drawe the blinde lines F R. F S. F T. lay alſo the Rular by the other end G. and euery of the points W. X. Y. & drawe other blinde lines to croſſe thoſe blinde lines in the points 1. 2. 3. Laſtly, drawe the lines F 1.| 1. 2.| 2. 3 |3. G.| ſo ſhall you include the figure F. 1. 2. 3. G. like the figure A B C D E. vpon the giuen line F G. which was required.

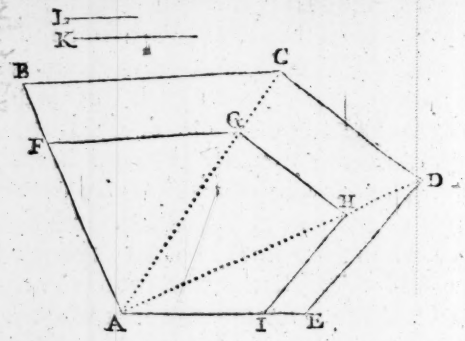
And in the ſame manner might you increaſe a plot, by making the line F G, longer, and then worke as before.

PROB. XCI.

To increaſe or decreaſe a figure giuen, according to any proportion required.

Let A B C D E. be a plot giuen, to be made leſſe in proportion, as L. to K.

By



p. 52.

BY the 52. Probleme, deuide one of the ſides (as AB) in power as L. to K. in ſuch ſort, that the power of A F. may be to the power of A B. as L. to K. Then from the angle A. drawe lines to the points C. and D. that done, by F. drawe a parralell to B C. to cut A C. in G. (as F G.) Againe, from G. drawe a parralell to C D. to cut A D. in H. Laſtly, from H. drawe a parralell to D E. to cut A E. in I. ſo ſhall the plot A F G H I. be like A B C D E. and in proportion to it as the line L. to the line K. which was required.

And if the leſſer plot were giuen, and it be required to make a greater in proportion to it, as K. to L. then from the point A. drawe the lines A C. and A D at length (alſo increaſe A F. and A I.) that done, by the 53. Probleme, inlarge A F. in power, as K. to L. which ſet from A. to B. then by B. drawe a Parralell to F G. to cut A C. in C. (as B C.) Likewiſe from C. a parralell to G H. to cut A D. in D. (as C D.) Laſtly, a parralell from D. to H I. (as D E.) to cut A I. (being increaſt in E.) ſo ſhall you include the plot A B C D E.

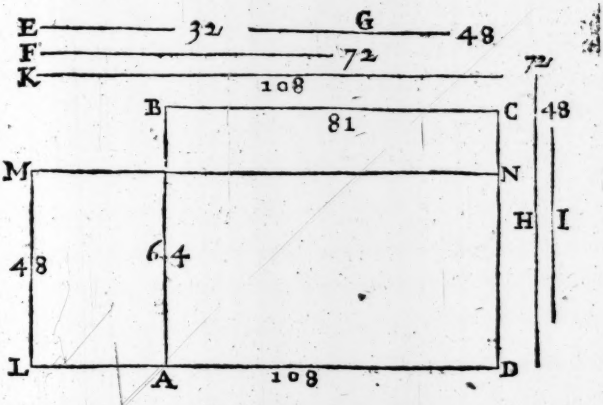
like

like AFGHI. and in proportion thereunto as the line K. to the line L. which was required.

Prob. XCII.

To reduce a long ſquare into another long ſquare, whoſe breadth ſhall haue proportion to his length, as one giuen line to another.

Let ABCD. be a long ſquare giuen, to be reduced into another long ſquare, whoſe breadth ſhall haue proportion to his length, as the line E. to the line F.



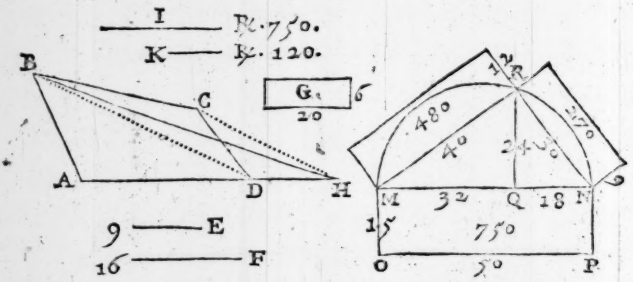
FIrſt by the 26. Probleme, finde a meane proportion betweene the giuen lines E. and F. which is G. finde alſo a meane betweene the breadth AB. and the length BC. which is H. That done, ſay by the 23. Probleme, if G. giue H. what F? anſwer the line K. for the length: Say againe, by the ſame rule, if G. 13 12 14 } 6.

giue H. what E? answer the line I. for the breadth: then of the lines I. K. make by the 14. Probleme, LMND. which shal be equal to the giuen long square ABCD. and yet the breadth to the length in proportion as the line E. to the line F. which was required.

Prob. XCIII.

A figure being giuen, to make two other figures equall to it, but each of those two, like another figure giuen, and yet the lesser to the greater in proportion as one giuen line to another.

Let ABCD. be a Trapezia giuen, and it is required to make two other figures each to be like the figure G. & yet both together in *Area* equall to ABCD. the figure giuen, and yet the leiser to haue proportion to the greater, as the line E. to the line F.



FIrst by the 47. Probleme, reduce the Trapezia into the triangle ABH. then that triangle by the 43. Probleme into a square, whose side will be the line I. that done, by the 40. Probleme reduce the figure G. also, into a square, whose side shall be the line K. Then reduce the giuen Trapezia ABCD. into a long square like G. after this manner. Say by the 23. Probleme, if K. giue

K. giue I. what the longer ſide of the figure G? anſwer the line M N. for the length, ſay againe, if K. giue I. what the breadth of the ſaid figure G? anſwer M O. for the breadth, whereof by the 14. Probleme, make the long ſquare M N P O. which ſhall be equall to the Trapezia A B C D. and like G. the figure giuen. Then for as much, as the figures to be made like G. are to haue proportion together as E to F. therefore by the 24. probleme, deuide the length of the long ſquare M N O P. equall to the Trapezia giuen, viz. M N. in Q. into two parts in proportion as E. to F, viz. that as E. to F. ſo N Q. the leſſer part to Q M. the greater. That done, vpon the line M N. deſcribe the ſemicircle M R N. and vpon the point Q. erect a perpendicular to cut the lymbde or Circomference in R then drawe the lines N R. and M R. which ſhall be the length of the figures to be made. Vnto which lengths M R. and R N. finde their breadths by the 23. probleme thus, ſay if the length of the giuen figure G giue his breadth, what M R? anſwer his breadth which is the line 12. then of the line M R. and the line 12. make the long ſquare 480. Say againe, if the length of the figure G. giue his breadth, what R N? anſwer the line 9. for the breadth of the long ſquare whoſe length is R N. Then of the lines R N. as the length and the line 9. as the breadth, make the long ſquare 270. which two long ſquares, viz. 480. and 270 are both like the giuen figure G. and together containe in *Area* ſo much as the giuen Trapezia A B C D. and yet the leſſer figure 270. is in proportion to the greater 480. as the line E. to the line F. which was required.

31.3.
31.6
8.6
4.6
Cor. 19.6.

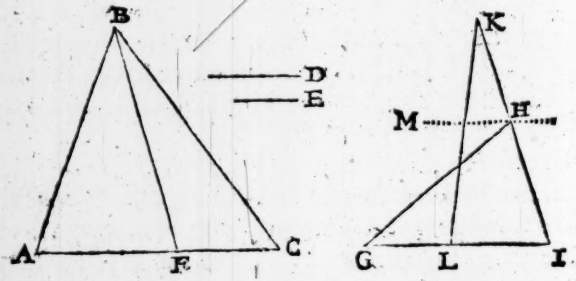
Now followeth a Compleat Instruction of the deuision of all right lined figures, in diuers kindes, being performed after a better way then by any former Writer.

Very pleasant, and full of delight in practise: Also, most profitable to all Surueighers, or others that are desirous to make any Inclosure.

Prob. XCIIII.

To deuide a Triangle according to a proportion assigned, with a line drawne from an angle giuen.

Let A B C. be a triangle giuen, to be deuided into two parts in proportion one to the other, as the line D. to the line E.



BY the 24. Probleme, deuide the baſe A C, in F: as D. to E. then drawe the line B F. ſo ſhall you deuide the triangle into two parts, as D. to E. required, for as D. to E. ſo the triangle A B F. to the triangle B C E, &c. P. 24. 1. 6.

Prob. XCV.

To cut off from a triangle, a part equall to a figure giuen, and to lay the part cut off towards any place appointed.

Let in the laſt Diagram A B C. be a triangle giuen, from the which it is required to cut off ſo much as the triangle G H I. containeth, and to lay the part cut off next C.

INcreaſe the ſide I H. at length, then by the 46. Probleme, reduce the triangle G H I. into the triangle K I L. whoſe perpendicular may bee of the length of the perpendicular of the giuen triangle A B C. from B. vpon his baſe AC. That done, take the baſe I L. & ſet it from C. to F. (becauſe it is required to lay the part cut off next C.) Laſtly, drawe B F. ſo ſhall the triangle B C F. be cut off, lying next C. and be equall to the giuen triangle G H I. which was required.

Hence alſo may be gathered, how to cut off from a figure giuen, any number of Acres, Roods, Poles &c. and to lay them towards a place appointed: For ſuppoſe $\frac{A}{3}$ $\frac{R}{1}$ $\frac{P}{3}$. were to be cut off, and to be layd next C.

First, make any triangle at pleasure, that may containe A R P 3 1 30. being made by the same scale whereby the triangle A B C. was layd downe. As let the triangle G H I. containe A R P 3 1 30. and then as before taught, cut off from the triangle giuen, A B C. a part equall to the triangle G H I. as B F C. and lay it next C. so shall you cut off A R P 3 1 30. which was required. The like is to be vnderstood in all the examples following.

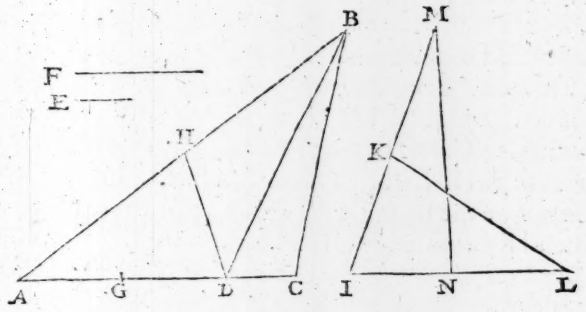
But here it will be nsceſſarie to ſhew the learner how to make a triangle to containe a nomber of Acres, Roods, Poles, &c.

As now to make the triangle G H I. to containe A R P 3 1 30. *Therefore proceed thus: Bring the* 3. *Acres, and* 1, *Roode into Roods, by multiplying the* 3. *Acres by* 4. *and adding in the* 1. *roode, ſaying* 4. *times* 3. *is* 12. *and* 1. *is* 13. *ſo doth* 3. *Acres and* 1. *roode containe* 13. *rood: Which* 13. *bring into Poles by multiplying them by* 40. *and adde in the* 20. *Pole (becauſe* 40. *Pole make one roode) ſo finde you* 540. *Poles to be contained in* A R P 3 1 30. *Now are you to make ſome kinde of triangle to containe* 540. *poles, which is thus done, double alwaies your number of poles, viz. now* 540. *maketh* 1080. *then take for the baſe of your triangle any number at pleaſure, as* 40. *by which deuide* 1080, *the double of the poles to be brought into a triangle: and your quotient is* 27. *which ſhall be the perpendicular, to that triangle whoſe content ſhall be* A R P 3 1 30. *and the baſe* 40. *as before. Therefore lay downe the baſe* 40. *any where, as in the former Diagram, from G. to I. then at the diſtance of* 27. *your quotient, drawe a parralell thereunto as the pricked line M H. that done, take any point in that parralell as the point H. from whence drawe lines to G. and I. the ends of the baſe, as G H. and H I. ſo ſhall you include the triangle G H I. which ſhall containe* A R P 3 1 30. *as was required.*

Prob. XCVI.

To deuide a triangle giuen into two parts in proportion according to two lines giuen, with a line drawne from a point in any side assigned.

Let A B C. be a triangle giuen, and let D. be a point assigned in the side A C. from whence it is required to drawe a line to deuide the triangle into 2. parts, hauing proportion one to the other, as the lines E. and F.



FIrst deuide the line or base A C. in G. as E. to F. by the 24. probleme, then drawe from the opposite angle B. a line to the giuen point D. as B D. that done, by the point G. drawe a parralell thereunto to cut the side A B. in H. Lastly, drawe the line D H. so shall you inclose the triangle A D H. which shall be in proportion to the rest D C B H. as the line E. to the line F. which was required. 1.6. 37.1.

Prob. XCVII

PROB. XCVII.

To cut off from a triangle giuen, a part equall to a figure giuen, with a line drawne from a point in any side assigned.

Let in the last Diagram A B C. be a triangle giuen, and let D. be a point assigned, in the side A C. from whence it is required to drawe a line to some part of the side A B. as D H. to inclose a part equall to the triangle I K L.

FIrst, by the 46. probleme, bring the triangle I K L. into the triangle I M N. whose perpendicular may be all one with the perpendicular to the giuen triangle A B C. That done, drawe from the giuen poynt D. a line to the opposite angle B. as D B. then set the base of the triangle I M N, viz. I N. on the base A C. from A. to G. and by G. drawe a parralell to D B. to cut A B. in H. Lastly, drawe the line D H. so shall you cut off the triangle A D H. equall to the figure giuen I K L. which was required.

P. 24. 37. 1. 1. 6.

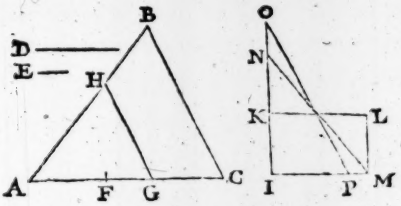
And the like worke for any number of Acres, Roodes, Poles, &c.

PROB. XCVIII.

To deuide a triangle giuen, according to a proportion assigned with a parralell to one of his sides.

Let A B C. be a triangle giuen, and it is required to deuide it into two parts in proportion one to the other, as the line D. to the line E. with a parralell to the side B C.

Deuide



DEuide the baſe A C. in F. as D. to E. that as D. to E. ſo C F. may be to F A. then finde a meane proportion by the 26. Probleme, between A F, and A C. which is A G. Laſtly, by G. drawe a parralell to the ſide C B. as G H. ſo ſhall you cut off the triangle A G H. hauing proportion to the reſt B C G H. as E. to D. which was required. 10. 6. 13. 6. Cor. 19. 6.

Prob. XCIX.

To cut off from a triangle, a part equall to a figure giuen, with a parralell to one of his ſides.

Let in the laſt Diagram A B C. be a triangle giuen, from the which it is required, to cut off ſo much as the long ſquare I K L M. with a parralell to the ſide B C.

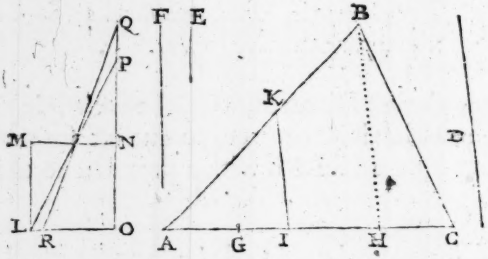
FIrſt increaſe the ſide of the long ſquare I K. at length to O. then ſet twiſe the breadth from I. to N, and drawe the line N M. ſo ſhall you include the triangle N I M. equall to the long ſquare giuen, which triangle reduce againe into a triangle,

whoſe perpendicular may be equall to the perpendicular of the giuen triangle A B C. as into the triangle I O P. whoſe baſe is I P. Laſtly, finde a meane proportion betweene that baſe and A C. the baſe of the giuen triangle, which will be A G. by which point G. drawe a parralell to the ſide B C. as G H. ſo ſhall you cut off the triangle A G H. equall to the giuen long ſquare I K L M. required.

PROB. C.

To deuide a triangle (with a parralell to a line giuen) according to any proportion aſſigned betweene two lines.

Let A B C. be a triangle, and D. a line giuen, and it is required to deuide the ſame into two parts with a parralell to D. in proportion one to the other, as the line E. to the line F.



BY the 24. Probleme deuide the baſe A C. in G. as E. to F. then by B. drawe a parralell to the line D. as the pricked line B H. to cut A C. in H. That done,

done, betweene A G. and A H. finde a meane proportion, as A I. then by the point I. drawe a parralell to the giuen line D. as I K. ſo is cut off the triangle A I K. which ſhall be in proportion to the reſt C B K I. as E. to F. which was required. P. 24 1. 6 Cor. 19. 6.

Prob. CI.

To cut off from a triangle, a part equall to a figure giuen, with a parralell to a line aſſigned.

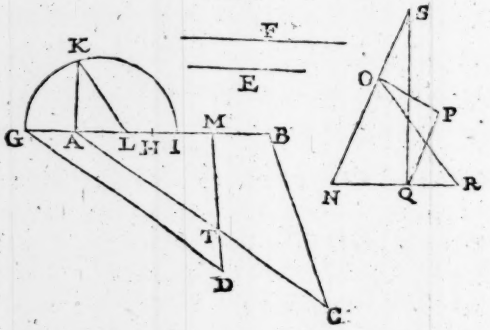
Let in the laſt Diagram A B C. be a triangle giuen, and let it be required to cut from it a part equall to the ſquare L M N O with a parralell to the line D.

FIrſt from B. drawe a parralell to the giuen line D. to cut the baſe A C. in H. then increaſe the ſide of the ſquare O N. to P. ſo that O P. may be iuſt twiſe the ſide O N. and drawe the line L P. ſo ſhall the triangle L O P. be equall to the ſquare giuen. Then reduce that triangle into the triangle O Q R. whoſe perpendicular O Q. may be equall to the perpendicular of the triangle A B C. that done, take the baſe thereof, viz. O R. and ſet that vpon the baſe A C. (of the giuen triangle) from A. to G. then finde a meane proportion betweene A G. and A H. as A I. and by the point I. drawe a parralell to the line D. as I K. which ſhall cut off the triangle A I K. equall to the ſquare giuen, as was required. 37. 1 p. 24 1. 6 Cor. 19. 6.

Prob. CII.

To deuide a triangle into two parts, according to any proportion giuen, with a line drawne from a point assigned without the triangle.

Let A B C. be a triangle giuen, and D. a point without, from whence it is required to drawe a line to deuide the triangle into two parts in proportion one to the other, as the line E. to the line F.



FIrſt increaſe the ſide B A. to G. Then by the point D. drawe a parralell to C A. as D G. to cut B A. being increaſed in G. that done, deuide A B. in H. as E. to F. that as E. to F. ſo A H. to H B. then, by the 23. Probleme, ſay if G D. giue A C. what A H? anſwer A I. which ſet from A. to I. that done, finde a meane proportion betweene G A. and A I. as A K. then deuide alwaies A I. into two equall parts, in L.

12. 6.
13. 6.
47. 1.
16. 6.

and

and drawe K L. which ſet from L. to M. Laſtly, from the point D. to the point M. drawe the line D M. ſo ſhall you cut off the triangle A M T. which ſhall be in proportion to the reſt C B M T. as the line E. to the line F. which was required.

Prob. CIII.

To cut off from a triangle a part equall to a figure giuen, with a line drawne from a point aſsigned without the triangle.

Let in the laſt Diagram A B C. be a triangle giuen, and D. a point without, from the which it is required to drawe a line to cut off from the triangle A B C. a part equall to the Trapezia N O P Q.

FIrſt increaſe B A. to G. then by the giuen point D. drawe a parralell to C A. as D G. to meet with B A. being increaſed in G. that done, by the 47. Probleme, bring the Trapezia into the triangle N O R. Then that triangle againe into the triangle N S Q. whoſe perpendicular may be equall to the perpendicular of the giuen triangle A B C. from C. vpon A B. (being increaſed) that done, take the baſe thereof viz. Q N. and ſet it on the baſe A B (of your triangle giuen) viz. from A. to H. Then ſay by the 23. probleme, if G D. giue A C. what A H? anſwer A I. which ſet from A. to I. that done, finde a meane proportion betweene A G. and A I. as A K. and deuide alwaies the line A I. into two equall parts in L. then drawe K L. which ſet from L. to M. Laſtly, from the giuen point D. to M.

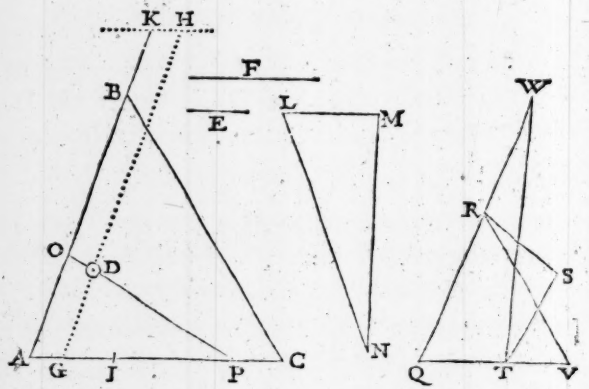
37.1. 12.6. 13.6. 47.6. 16.6.

drawe the line DM. which cutteth off the triangle ATM. equall to NOPQ. the Trapezia giuen, as was required.

Prob. CIIII.

Through a giuen point within a triangle, to drawe a line to deuide the triangle according to any (possible proportion) betweene two lines giuen.

Let ABC. be a triangle giuen, and D. a point within, through the which it is required to drawe a line to deuide the triangle into two parts in proportion one to the other, as the line E. to the line F.



FIrst consider through which sides the line of partition OP. must passe, which will be AB. and AC. then by the point D. drawe a parralell to AB.

as

as G H. to cut the baſe A C. in G. that done, by the 24. probleme, deuide the baſe A C. in I. as E. to F. Then ſay by the 23. probleme, If A G. (that part of the baſe cut by the parralell H G. adioyning to that ſide, vnto which the parralell was drawne, viz. A B.) giue the $\frac{1}{3}$ perpendicular from B. vpon the baſe A C. what A I? anſwer, a line, at the diſtance wherof, drawe a parralell to the baſe A C. as the pricked line K H. 29. 1
to cut the ſide A B. if it may, if not, increaſe it till it 26. 1
meet with that parralell in K. Then note where the 4. 6
two parralells viz. G H. and K H. meet, which is in 31. 6.
the point H. That done, take by the 55. probleme, the ſquare of G D. from the ſquare of D H. reſt in the right angled triangle L M N. the ſquare of M N. which take, and ſet vpon the ſide A B. being increaſed from K. to O. Laſtly, lay your Rular by the points O. and D. and drawe the line O D P. ſo ſhall you cut off the triangle A O P. which ſhall haue proportion to the part remaining O B C P. as the line E. to the line F. which was required.

PROB. CV.

To cut off from a triangle with a line drawne through a poinſ within, (if it be poſſible) a part equall to a figure giuen.

Let A B C. in the laſt Diagram, be a triangle giuen, from whence it is required to cut off ſo much as the figure Q R S T. with a line drawne through the point D. within.

First,

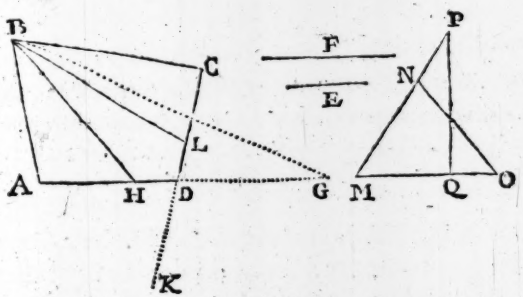
FIrſt bring the figure giuen into a triangle by the 47. Probleme, as into the triangle QRV. then, that triangle into the triangle Q T W. whoſe perpendicular from W. may be equall to the perpendicular from B. vpon the baſe A C. of the giuen triangle, ſo is the baſe of that triangle Q T W. the line Q T. then ſeeing ſo much as the triangle Q T W. is to be cut off with a line drawne through the point D. therefore conſider through which ſides of the triangle A B C, the line of partition O P. ſhall paſſe, which will be the ſides A B. and A C. therefore by D. drawe a parralell to A B. as G H. that done, ſet the baſe of the triangle Q T W. (equall to your figure giuen to be cut off) from A. to I. (vpon the baſe A C.) Then ſay by the 23. Probleme, if A G. (the part of the baſe cut by the parralell H G. adioyning to the ſide A B. whereunto that parralell was drawne) giue the ½ perpendicular from B. vpon A C. what A I? anſwer a line, at the diſtance whereof, drawe a parralell to the baſe A C. as the pricked line K H. to cut the ſide A B. if it may, & if not, increaſe it till it do meet with that parralell, then note where thoſe two parralels meet, viz. G H. and K H. which is in H. that done, take the ſquare of G D. from the ſquare of D H. ſo reſt the line M N. (in the right angled triangle L M N) for the ſide of a ſquare equall to the remainder, which line M N. take, and ſet from K. to O. vpon the ſide A B. being increaſt. Laſtly, lay your Rular by the points O D. and drawe the line O D P. which cutteth off the triangle A O P. equall to Q R S T. the figure giuen, which was required.

37. 1
29. 1
26. 1
4. 6
31. 6.

Prob. CVI.

To deuide a Trapezia giuen, according to any proportion betweene two lines, with a line drawne from an angle assigned, and to lay the part cut off towards a place appointed.

Let A B C D. be a Trapezia giuen, the which is to be deuided into two parts, as E. to F. with a line drawne from the angle B. and to lay the lesser part next A.



REduce the Trapezia into the triangle A B G. by the 47. probleme, whose base is the line A G. being increased to G. which A G. by the 24. probleme, deuide in H. as E. to F. then drawe the line B H. so shall you cut off the triangle A B H. which shall be in proportion to the part remaining B C D H. as the line E. to the line F. as was required. 37. 1 10. 6 1. 6

But if the greater part were required to be left towards A. then the line of partition drawne from B. will light vpon the side C D. and then must you re-

duce your Trapezia into a triangle, making C D. (increased the base) therfore by the 47. Probleme finde the point K. so is C K. the whole base, then deuide C K. in L. as E. to F. by the 24. Probleme, and drawe the line B L. so shall B C L. the lesser part, lye next C. and B A D L. the greater next A. and be in proportion one to the other, as E. to F. which was required.

And if it were to drawe a line from the angle C. then the side B A. must haue bene increased, and the Trapezia brought into a triangle by the 47. probleme whose base must be the side B A. increased, and then worke as before taught.

Prob. CVII.

From a Trapezia giuen, to cut off a part equall to a figure giuen, with a line comming from an angle assigned and to laye the part cut off towards a place appointed.

Let in the last Diagram A B C D. be a Trapezia giuen, from whence it is required to cut off so much as the figure M N O. and to lay the part cut off next A.

BY the 46. probleme, reduce the triangle M N O. into the triangle M P Q. whose perpendicular may be equall to the perpendicular of the triangle A B G. (from B. vpon the base A G.) then take the base of that triangle viz. Q M. and set it from A to H. and drawe the line B H. so shall the triangle A B H. be cut off with a line drawne from the angle B. and be layd next A. whose content shall be equall to the giuen figure M N O. which was required.

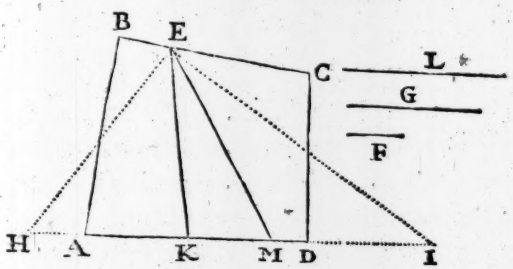
37. 1.
1. 6.

Prob. CVIII.

Prob. CVIII.

To deuide a Trapezia into two parts, according to any proportion required, with a line drawne from a point, assigned in any of his sides.

Let A B C D. be a Trapezia giuen, and let E. be a point assigned in the side B C. from the which it is requird, to drawe a line that shall deuide the Trapezia into two parts, as F. to G.



FIrst increase the base both waies to H. & to I. then from the point E. by the 47. probleme, drawe the lines E H. and E I. and bring the Trapezia into the triangle H E I. whose base shall be H I. the which deuide in K. by the 24. probleme, as F. to G. Lastly, drawe the line E K. so shall you deuide the giuen Trapezia A B C D. with a line drawne from the point E. into two parts, viz. A B E K. and E C D K. in proportion one to the other, as the line E. to the line F. which was required. 37. 1 10. 6 1. 6

PROB. CIX.

To cut off from a Trapezia, with a line drawne from a point in any of his sides, a part equall to a figure giuen.

Let in the last Diagram A B C D. be a Trapezia giuen, from whence it is required to cut off so much as a square made of the line G. containeth.

FIrst, by the 47. probleme, bring the Trapezia into the triangle H E I. Then reduce the square, whose side is G. into a triangle, whose perpendicular may be equall to the perpendicular of the triangle H E I. (from E. vpon the base H I.) so shall the base of that triangle come to be the line L. which take & set from H. to K. and drawe E K. So shall you cut off the Trapezia A B E K. equall to that square whose side is the giuen line G. which was required.

37. 1.
10. 6.
1. 6.

And if you would haue the lesser part cut off to be next D. then set the line L. from I. to M. and drawe E M. so shall you cut off the part E C D M. next D. which shall be in proportion to the rest A B E M. as F. to G. required.

Yet must I herein aduise you one thing, that if you intend to lay the part cut off next A. that then there is no necessitie, to reduce the whole Trapezia into a triangle, as to make the triangle H E I. but it may suffice to drawe the line E H. by the 48. probleme, to take in so much as it cuts off, and then reduce your figure giuen to be cut off, into such a triangle whose perpendicular may be equall to the perpendicular from E.

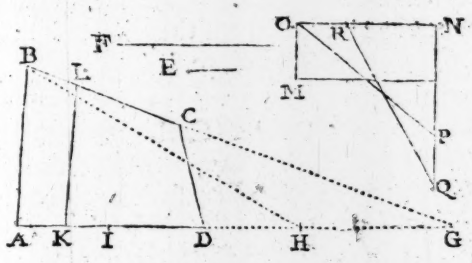
from E. vpon A D. and then the baſe of that reduced triangle being ſet from H. to K. and the line EK. being drawne, it performeth the demaund.

But this may be only done, when a figure giuen, or a ſumme of Acres is required to be cut off, but not when it is required, to deuide the plot into two parts in proportion, to two lines giuen, as the 108. problem requires, for then it is of neceſſitie to bring the whole Trapezia into a triangle, &c.

Prob. CX.

To deuide a Trapezia giuen, into two parts, with a parralell to one of his ſides, in ſuch proportion one to the other, as two lines giuen, and to lay the part required towards a place aſſigned.

Let A B C D. be a Trapezia giuen, to be deuided into two parts, with a parralell to the ſide A B. In ſuch ſort, as the leſſer part may haue proportion to the greater, as the line E. to the line F. and to lay the bigger part next D. and the leſſer next A.



First, consider through which two sides the line of partition KL. must passe, (for those two sides must alwaies be increased till they meet) which sides are AD. and BC. which increase till they meet in G. That done, by the 47. Probleme, reduce the Trapezia ABCD. into the triangle ABH. whose base is AH. or which is better, hauing found the point H. it suffiseth: and there is no need to drawe the line BH. for it doth but obscure and darken the worke, and is bet-
37. 1
10. 6
1. 6
13. 6 ter out then in, well then, hauing the point H. The base of that triangle equall to the Trapezia shall be AH. which deuide by the 24. Probleme in I. as E. to F. viz. that as E. to F. so AI. the lesser part next A (because the lesser part is to be layd next A.) to IH. the greater part. That done, betweene GI. and GA. finde a meane proportion, as GK. Lastly, by the point K. drawe a parralell to the side AB. as KL. so shall you cut off the lesser part ABLK. (next A.) which shall haue proportion to the greater part KLCD. next D. as the line E. to the line F. as was required.

But if the part required to be cut off, had beene with a parralell to AD. then the line of partition would passe through the sides AB. and DC. which must haue bene increased till they meete, and then proceed in all points as before.

Prob. CXI.

To cut off from a Trapezia, with a parralell to one of his sides, a part equall to a figure giuen, and to lay the part cut off towards a place appointed.

Let in the last Diagram MN. be a long square giuen

giuen to be cut off, from the Trapezia A B C D. with a parralell to the ſide A B. and to lay the part cut off next A.

FIrſt as before, conſider through which ſides the line of partition ſhal paſſe, which are B C. and A D which increaſe till they meet in G. That done, reduce the long ſquare M N. into the triangle O N P. and that triangle againe into the triangle R N Q. (whoſe perpendicular N Q. may be equall to the perpendicular from B. vpon A H.) ſo ſhall his baſe be the line N R. which take, and ſet from A. to I. (becauſe it is to be laid next A) That done, betweene G I. and G A. finde a meane proportion as G K. Laſtly, from K. draw a parralell to the ſide A B. as K L. ſo ſhall you cut off the part A B L K. equall to M N. the long ſquare giuen, which was required. 37. 1 13. 6 1. 6

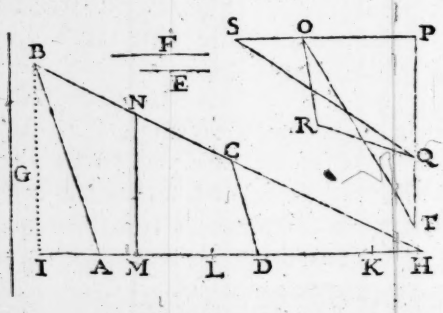
And if the part cut off equall to the long ſquare M N. ſhould haue bene laid next D. then you muſt firſt haue found the point H. and then haue ſet the diſtance N R. from H. towards A. and ſo haue proceeded as before, but ſeeing it is to lye next A. there is no need at all, to finde the point H. but only proceed as before taught, &c.

Prob. CXII.

To deuide a trapezia into two parts, according to any proportion betweene two lines, with a parralell to a line giuen, and to lay the part required towards a place aſſigned.

Let A B C D. be a Trapezia giuen, to be deuided into

into two parts in proportion one to the other, as the line E. to the line F. with a parralell to the line G. and to lay the greater part next D.



FIrſt, conſider through which ſides the line of partition ſhall paſſe, which will be the ſides A D. and B C. which increaſe till they meete in H. then by B. drawe a parralell to the giuen line G. as B I.
37. 1 to meete with the baſe D A. (being increaſed) in I. that
10. 6 done, by the 47. probleme, finde the point K. vnto
1. 6 which point a line drawne from B. ſhould include a
Cor. 19. 6. triangle equall to the Trapezia giuen, ſo is A K. the whole baſe of that triangle, which deuide in L. as E. to F. and lay the bigger part K L. next D. (becauſe it is ſo required) that done, betweene H L. and H I. finde a meane proportion, as H M. Laſtly, by the point M. drawe a parralell to the giuen line G. as M N. ſo ſhall you deuide the Trapezia A B C D. into two parts, with a parralell to the line G. and lay the bigger part D C N M. next D. and the leſſer part M N B A. next A. as was required.

PROB. CXIII.

Prob. CXIII.

To cut off from a Trapezia a part equall to a figure giuen, with a parralell to a line drawne by chaunce, and to lay the part cut off towards a place assigned.

Let in the last Diagram A B C D. be a Trapezia giuen, from whence it is required, to cut off so much as the figure O P Q R. with a parralell to the line G, and to lay the part cut off next A.

FIrst consider, through which sides, M N. the line of partition shall passe, which are AD. and BC. which increase till they meet in H. that done, reduce O P Q R your figure giuen to be cut off, into the triangle Q P S by the 47. Probleme. & againe that triangle into the triangle O P T. by the 46. probleme, whose perpendicular P T. may be equall to the perpendicular from B. vpon H A. (being increased) so shall his base be P O. which take, and set vpon the base A K. from A. towards K. (because the part cut off must lye next A.) endeth in L. then drawe from B. a parralell to the giuen line G. to cut the base H A. (being increased) in I. as the pricked line B I. That done, finde a meane proportion betweene H L. and H I. as H M. Lastly, by M drawe a parralell to the giuen line G. as M N. so shall you cut off next A. the part A B N M. equall to the giuen figure O P Q R. required. 37. 1 1. 6 Cor. 19. 6.

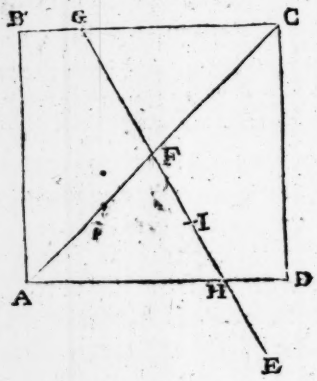
Note, that what hath bene said of a Trapezia, conserning the deuision, according to any proportion betweene two lines, or cutting off a part equall to a figure ginen, either with a

line drawne from any angle, from a point in one of the ſides, or with a parralell to a line giuen, that the ſame may alſo be done to a ſquare, long ſquare, Rombus, or Romboides, being likewiſe figures of foure ſides, &c.

Prob. CXIIII.

To deuide a ſquare into two equall parts, with a line drawne from a point without the ſquare.

Let ABCD. be a ſquare giuen, and let E. be a point without, from whence it is required to drawe a line, which ſhall deuide the ſquare into two equall parts.



FIrſt, drawe the Diagonall AC. which deuide
15.1. in the midſt in F. then laying your Rular by the
29.1. points E. and F. drawe the line EHIFG. which ſhall
26.1 deuide the ſquare into two equall parts, viz. ABGH and GCDH. both equall one to the other, with a line

line drawne from the point E. as was required.

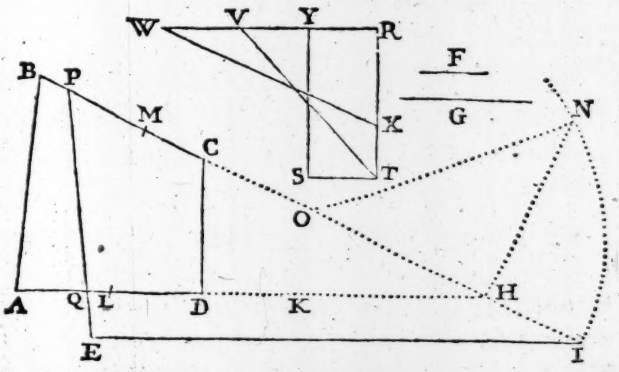
Note alſo, that if the point had beene in the ſide, or within the ſquare, as in H. or I. that it is done in the ſame manner.

The like may be done to a long ſquare, a Rombus, or a Romboides.

Prob. CXV.

To deuide a Trapezia according to any proportion giuen, with a line drawne from a point without the Trapezia, and to lay the part deſired, towards a place appointed.

Let A B C D. be a Trapexia giuen, and let E. be a point without, from whence a line is to be drawne, to deuide the Trapezia into two parts, ſo that the leſſer part may haue proportion to the bigger, as the line F. to the line G. and to lay the leſſer part next A.



FOr as much as the line must be drawne from the point E. it must passe through the sides A D. and B C. therefore increase them till they meet in H. then by the point E. drawe a parralell to A H. as E I. to meet with B H. being drawne forth in I. that done, finde the point K. by the 47. probleme, so is A K. the base of a triangle, equall to the Trapezia, and the shortest distance from B. to A H. the perpendicular, then deuide A K. in L. as F. to G. (and becaus the lesser part cut off, is to lye next A.) therefore set the lesser part of the base so deuided from A to L. That done, say by the 23. probleme, if I E. giue H L. what H B? answer H M. then finde a meane proportion betweene I H. and H M. as H N. that done, deuide alwaies H M. into two equall parts in O. and drawe the line O N. which set from O to P. Lastly, from the point E. to the point P. drawe the line E P. so shall you deuide the Trapezia into two parts, and the lesser part A B P Q. to lye next A. and to haue proportion to the greater part P C D Q. as the line F. to the line G. which was required.

10. 6.
13. 6.
47. 1.
16. 6.

Prob. CXVI.

To cut off from a Trapezia, a part equall to a figure giuen, with a line drawne from a point assigned without: and to lay the part cut off towards a place appointed.

Let A B C D. be a trapezia, and E. a point giuen, from whence it is required, to drawe a line to cut off so much as the long square R S. and to lay the part cut off next A.

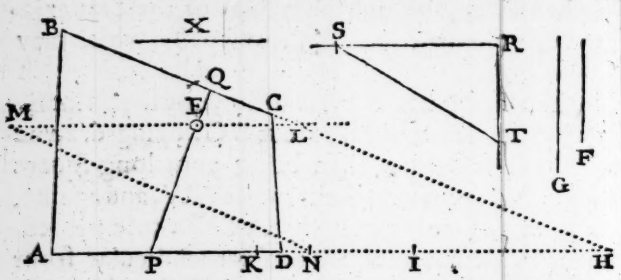
First

FIrſt conſider, through what ſides of the Trapezia, the line of partition E Q P. muſt paſſe, which may eaſily appeare to be the ſides A D. and B C. the which increaſe till they meet in H. That done, by the point E. drawe a parralell to A H. to cut B C. being drawne forth in I. as before, then bring your long ſquare giuen to be cut off into the triangle T R V. and againe, that triangle into the triangle R W X. whoſe perpendicular W R. may be equall to a perpendicular from B. (in the Trapezia) vpon the baſe A D. In which triangle W R X. the ſide R X. is the baſe, and R W. the perpendicular, which baſe take, and ſet from A. to L. vpon the baſe A D. (becauſe the part cut off is required to be laid next A.) then ſay by the 23. probleme, if I E. giue H L. what H B? anſwer H M. and then to finde the point P. proceed altogether, as in the laſt probleme was taught, for there is no difference in the worke, then drawe E P. ſo ſhall you cut off the part A B P Q. equall to the giuen long ſquare R T S Y. with a line drawne from the point E. as was required. 37. 1 13. 6 47. 1 16. 6

Prob. CXVII.

To deuide a Trapezia into two parts, (according to any poſſible proportion giuen) with a line drawne through a point within.

Let A B C D. be a Trapezia giuen, alſo let E. be a point within, and it is required to deuide the Trapezia, into two parts in proportion one to the other, as the line F. to the line G. with a line paſſing through the point E. within.



FIrſt conſider through which two ſides the line of partition P E Q. muſt paſſe, which will be the ſides A D. and B C. therefore increaſe them till they meet in H. that done, finde the baſe of a triangle equall to the Trapezia giuen, whoſe perpendicular may be the perpendicular from B. vpon A D. by the 47. probleme, which baſe will be A I. which deuide in K. according to your lines giuen, viz. that as F. to G. ſo I K. to K A. then by the point E. drawe a parralell to A D. as L M. that done, let fall a perpendicular
37.1 from E. to A D. or take the ſhorteſt diſtance from E.
10.6 to A D. then ſay, by the 23. probleme, if that perpen-
12.6 dicular or diſtance giue the perpendicular from B. v-
47.1 pon A D. what the $\frac{1}{2}$ of H K? anſwer H N. which ſet
31.6 from H. to N. by the which point N. drawe a parralell to H B. as N M. to cut L M. in M. then take the ſquare of E L. from the ſquare of E M. by the 55. prob. the reſt (which in the right angled triangle T R S) is R S. ſet from N. to P. then by P. and the point E. draw the line P E Q. ſo ſhall you deuide the Trapezia into two parts, with a line drawne through the point E. viz. Q C D P. the leſſer, and Q B A P. the bigger part, and in ſuch ſort, that the leſſer ſhall haue proportion to the bigger, as E. to F. which was required.

PROB. CXVIII.

Prob. CXVIII.

To cut off from a Trapezia, with a line drawne through a giuen point within, (a poſsible part) equall to a figure giuen.

Le in the laſt Diagram A B C D. be a Trapezia, and E. a point giuen, and it is required to drawe a line through the point E. which ſhall cut off a part equall to the ſquare, whoſe ſide is the line X.

FIrſt increaſe the ſides through which the line of partition muſt paſſe, till they meet in H. then by the 47. prebleme, finde the baſe of a triangle equall to the Trapezia giuen, which will be A I. that done, reduce the ſquare, whoſe ſide is the line X. into a triangle, whoſe perpendicular may be equall to the perpendicular from B. vpon A D. ſo ſhall his baſe be the diſtance I K. which ſet from I. to K. and then proceed in all points as before, and finde the point P. then drawe the line P E Q. ſo ſhall you cut off the figure P D C Q. equall to the ſquare, whoſe ſide is the line X. which was required. 37. 1 12. 6 47. 1 31. 6

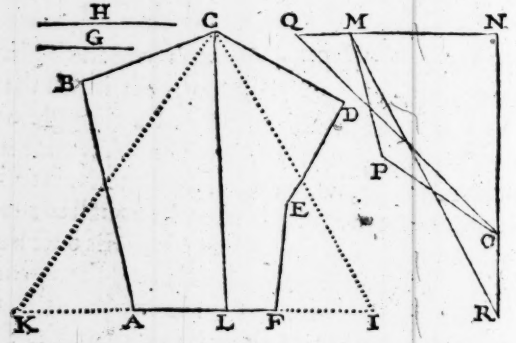
And in the ſame manner, may be cut off a number of Acres, with a line drawne through the point E. For make any figure to containe ſo many Acres as the ſquare, whoſe ſide is the line X. containeth, then cut off C D P Q. equall thereunto as already taught, ſo ſhall you cut off, ſo many Acres with a line drawne through a giuen point within, as was required.

Prob. CXIX.

Prob. CXIX.

To deuide a plot giuen, according to any proportion assigned, with a line drawne from an angle appointed, and to lay the part required, toward a place assigned.

Let ABCDEF. be a plot giuen, to be deuided into two parts, (as G. to H) with a line drawne from the angle C. and to lay the lesser part next A.



FIrst consider on what side the line drawn from C. must fall, which will be the side AF. which drawe forth both waies at length to I. and to K. then by the 47. probleme, or by the latter part of the 48. reduce the plot into a triangle, with two lines drawne from the angle C. or only finde the points I. and K. (which is better) so shall IK. be the base of a triangle equall to the whole plot, whose perpendicular is the shortest distance from C. vpon

37. 1.
10. 6.

that

that baſe. That done, deuide IK. in L. as G. to H. ſo that as G. to H. ſo IL. to LK. (and becauſe the leſſer part is to be laid next F.) therfore hauing deuided the baſe IK. according to the lines GH. ſet the leſſer part from I. to L. els muſt it haue ben ſet from K. towards I. Laſtly, drawe the line CL. ſo ſhall you deuide the plot into two parts, with a line drawne from the angle C. in proportion one to the other, as G. to H. which was required.

Prob. CXX.

To cut off from a plot, with a line drawne from an angle aſſigned, a part equall to a figure giuen, and to lay the part cut off towards a place appointed.

Let in the laſt Diagram MNOP. be a figure giuen, to be cut off from the plot ABCDEF. with a line drawne from the angle C. and to lay the part cut off next F.

HEre you muſt likewiſe conſider, to what ſide the line of partition CL. muſt be drawne, for that is alwaies to be firſt increaſed that way, as the figure cut off is to be laid, and in this caſe, there is no need to finde the baſe of a triangle equall to the whole plot as before: But it may ſuffice by the 48. probleme to drawe the line CI. (on that ſide as the plot is to be laid) or only to finde the point I. and not the point K. at all. That done, reduce your figure MNOP. giuen to be cut off, into ſuch a triangle, whoſe perpendicular may be equall to the perpendicular from C. (in the plot) to the baſe AF. as firſt into the triangle, 37. 1. 1. 6.

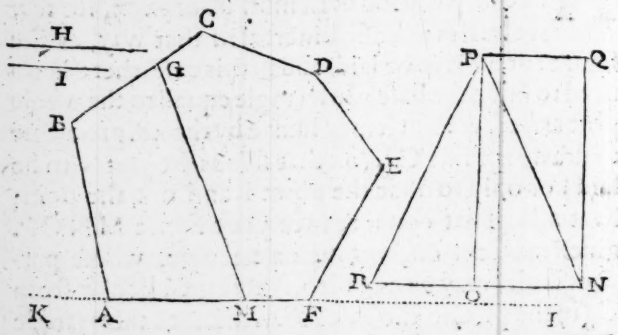
QNO. then that into the triangle MNR. whoſe perpendicular NR. may be equall to perpendicular from C. on IK. the baſe of the plot, ſo ſhall your figure MNOP. be at laſt brought into the triangle MNR. whoſe baſe is NM. which take and ſet in the plot from I. to L. (becauſe it is required to lay the part cut off next F.) Laſtly, drawe from C. to
7.1 L. the line CL. ſo ſhall you cut off the figure CDEFL
1.6 equall to MNOP. your figure giuen, with a line drawne from the angle C. as was required.

And in the ſame manner may you cut off a number of Acres Roods, Poles, &c. and lay them towards a place appointed.

Prob. CXXI.

To deuide a plot according to any proportion giuen, with a line drawne from a point aſſigned in any of his ſides, and to lay the part required towards a place appointed.

Let ABCDEF. bee plot giuen, and let G. be a point aſſigned in the ſide BC. from whence a line is to be drawne to deuide the plot into two parts in proportion one to the other, as the line H. to the line I. and to lay the bigger part next F.



First

FIrſt, conſider to what ſide the line of partition G M. muſt be drawne, which will appeare to be the ſide A F. which increaſe both waies to K. and to L. That done, by the latter part of the 48. probleme, finde K L. for the baſe of a triangle, equall to the whole plot, whoſe perpendicular is the ſhorteſt diſtance from the point G. on that baſe, then deuide that baſe in M. as the line H. to the line I. (and becauſe the bigger part is to be laid next F. therefore ſet the bigger part of the baſe (being ſo deuided) from L. towards K. endeth in M. Laſtly, from the aſſigned point G. drawe to M. the line G M. ſo ſhall you deuide the plot into two parts in proportion one to the other, as the line H. to the line I. with a line drawne from the point G. and lay the bigger part next F. which was required. 37. 1 10. 6

PROB. CXXII.

To cut off from a plot giuen, with a line drawne from a point in one of his ſides, a part equall to a figure giuen, and to laye the part cut off towards a place appointed.

Let in the laſt Diagram A B C D E F. be a plot, and N O P Q. be a figure giuen, and it is required from the plot, to cut off ſo much as the figure N O P Q. with a line drawne from the point G. and to lay the part cut off next A.

HEre is no need to finde the baſe of a triangle equall to the whole plot as before, but it may ſuffice to lengthen the ſide F A. and to finde the point K. by the 48. probleme, which is one end of the baſe of a triangle equall to the whole plot, whoſe perpendicular is the ſhorteſt diſtance from G. vpon that baſe, (and heere note, that the baſe F A. muſt be increaſed that way as the part cut off is to be laid, viz. towards A.) That done, reduce your figure giuen N O P Q. to be cut off into ſuch a triangle, whoſe perpendicular may be equall to a perpendicular from the giuen point G. vpon the baſe (of the plot) AF. as into the triangle NPR. whoſe baſe is NR. which take and ſet from K. to M. Laſtly, from the point G. to M. drawe the line G M. which ſhall cut off the part A B G M. next A. equall to the giuen figure N O P Q with a line drawne from the point G. as was required.

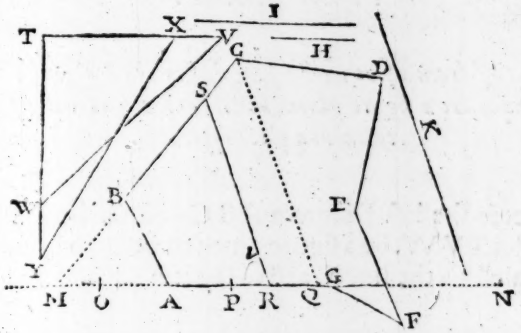
37. 1.
1. 6.

Prob. CXXIII.

To deuide a plot according to any proportian aſſigned, betweene two lines, with a parralell to a line giuen, and to lay the part required towards a place appointed.

Let A B C D E F G. be a plot giuen, to be deuided into two parts, in proportion one to the other, as the line H. to the line I. with a parralell to the line K. and to lay the leſſer part next A.

First,



FIrſt conſider through which ſides the line of partition R S. ſhall paſſe, which will be the ſides G A and C B. which increaſe till they meet in M. alſo, drawe forth the ſide or baſe A G. to N. then by the latter part of the 48. probleme, finde the whole baſe of a triangle equall to the plot, which will be O N. whoſe perpendicular ſhall be the ſhorteſt diſtance from C. to the baſe. Then deuide that baſe O N. in P. as H. to I. and ſet the leſſer part from O. to P. next A. (becauſe it is ſo required) Then by C. drawe a parralell to the giuen line K. to cut the baſe O N. in Q. as the pricked line C Q. That done, betweene M P. and M Q. finde a meane proportion, as M R. Laſtly, by the point R. drawe a parralell to the line K. as R S. ſo ſhall you deuide the giuen plot into two parts, as H. to I. and alſo lay the leſſer part next A. with a parralell to the line K. as was required. 37. 1 10. 6. 1. 6 13. 6

Prob. CXXIIII.

To cut off from a plot with a parralell to a line giuen, a part equall to a figure giuen, and to lay the part cut off towards a place appointed.

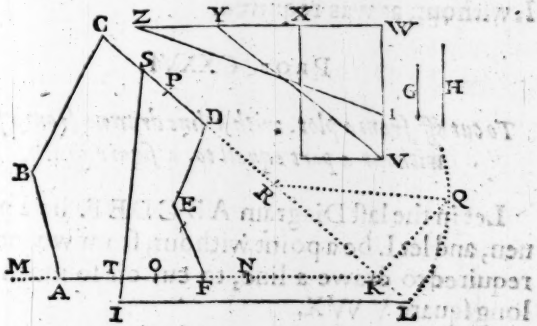
Let in the last Diagram A B C D F G. be a plot, and let T V W. be a figure giuen to be cut off, with a parralell to the line K. and to lay it next A.

FIrst consider through what sides the line of partition must passe which are G A. and C B. which increase till they meet in M. then by the 48. probleme, finde the base of a triangle equall to the whole plot, as O N. whose perpendicular is the shortest distance from G. vpon that base, That done, reduce your figure giuen to be cut off, viz. T V W. into a triangle, 37. 1 1. 6 whose perpendicular may be equall to a perpendicular from C. vpon the base O N. as into the triangle Cor. 19. 6. T X Y. whose base is T X. which take and set from O. to P. Then by C. drawe a parralell to the line K. as the pricked line C Q. to cut the base O N. in Q. That done, finde a meane proportion betweene M Q. and M P. as M R. Lastly, by the point R. drawe a parralell to the giuen line K. as R S. so shall you cut off the part B A R S. equall to T V W. the figure giuen, and lay it next A. with a parralell to the line K. as was required.

PROB. CXXV.

To deuide a plot, according to any proportion assigned, with a line drawne from a point without.

Let A B C D E F. be a plot giuen, to be deuided into two parts in proportion one to the other, as the line G. to the line H. with a line drawne from the point I.



FIrst consider, through which sides the line drawne from the point I. must passe, which will appeare to be A F. and C D. therfore, increase them till they meet in K. and drawe forth C D. at length to L. then by the point I. drawe a parralell to A K. as I L. to meet with C D. being drawne forth in L. That done, finde by the 48. probleme, the points M N. so is the line M N. the base of a triangle equall to the whole plot, whose perpendicular is the shortest distance from C. vpon that base, which base M N. deuide by the 24. probleme,

37.1. 24. probleme, in O. as G. to H, viz. that as G. to H.
10.6. ſo N O. to O M. then ſay by the 23. probleme, if L I.
13.6 giue K O. what K C? anſwer K P. that done, between
47.1 L K. and K P. finde a meane proportion, as K Q. then
16.6 deuide alwaies, K P. into two equall parts in R. and drawe the line R Q. which ſet from R. to S. Laſtly, from the point I. to S. drawe the line I T S. ſo ſhall you deuide the plot giuen, A B C D E F. into two parts, viz. S D E F T. the leſſer, and S C B A T. the bigger, in proportion one to the other, as the line G. to the line H. and with a line drawne from the point I. without, as was required.

Prob. CXXVI.

To cut off from a plot, with a line drawne from a point without a part equall to a figure giuen,

Let in the laſt Diagram A B C D E F. be a plot giuen, and let I. be a point without, from whence it is required to drawe a line, to cut off ſo much as the long ſquare V W X.

First as before, conſider through which ſides the line of partition ſhall paſſe, which are A F. and C D. the which increaſe till they meet in K. then finde the point N. by the 48. probleme (for it needeth not to finde the point M. and ſo to get the whole baſe of a triangle equall to your plot) That done, reduce
37.1. your figure giuen to be cut off, viz. V X. into the tri-
13.6. angle V W Y. and againe, that triangle into the tri-
47.1. angle Z W 1. whoſe perpendicular Z W. may be e-
16.6. quall to a perpendicular from C. vpon the baſe A F.

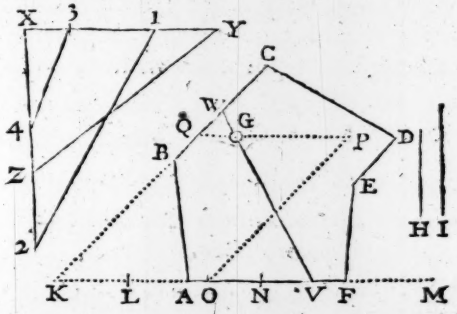
of

of your plot giuen, then is the baſe of that triangle W I. which take and ſet from N. to O. then according to the laſt probleme, finde the point S. and draw the line I T S. which ſhall cut off the figure S D E F T. equall to V W X. the long ſquare giuen, which was required.

Prob. CXXVII.

To deuide a plot into two parts, (according to any poſsible proportion giuen) with a line drawne through a point within.

Let A B C D E F. be a plot giuen, and let G. be a point within, & it is required to drawe a line through that point to deuide the plot into two parts in proportion, as the line H. to the line I.



FIrſt conſider, through which ſides the line of partition ſhall paſſe, which will eaſily appeare to be the ſides C B. and F A. the which increaſe till they meet in K. then by the 48. probleme, finde L M. the baſe of a triangle equall to the whole plot, (whoſe perpendicular is the ſhorteſt diſtance from C. vpon that baſe,) which baſe L M. deuide by the 24. pro-

bleme, in N. as H. to I. ſo that as H to I. LN. may be to NM. That done, from the point G. within, let fall a perpendicular to the baſe LM. or take the ſhorteſt diſtance to it, and then ſay by the 23. probleme, if that perpendicular or ſhorteſt diſtance, giue the perpendicular from C. vpon the baſe LM. what the ⅓ of KN? anſwer KO. which ſet from K. to O. then by O. drawe a parralell to KC. as OP. and by the point G drawe alſo a parralell to the baſe LM. as QGP. to meet with the other parralell in P. That done, take by the 55. probleme, the ſquare of QG. from the ſquare of GP. reſt in the right angled triangle 3X4. the line X4. for the ſide of a ſquare remaining, which take, and ſet from O. to V. Laſtly, drawe the line VGW. which ſhall deuide the plot into two parts viz. WBAV. and WCDEFV. in proportion one to the other, as the line H. to the line I. and with a line drawne through the point G. within, as was required.

37. 1.
10. 6
12. 6.
47. 1.
31. 6

PROB. CXXVIII.

To cut off from a plot giuen (a poſsible part) equall to a figure giuen, with a line drawne through a point within.

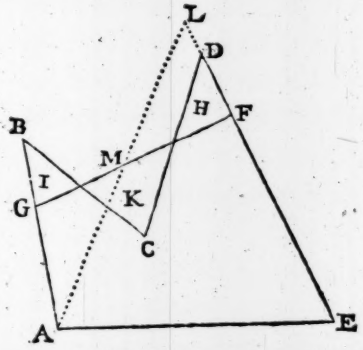
Let in the laſt Diagram ABCDEF. be a plot giuen, and let it be required to cut from it ſo much as the triangle YXZ. with a line drawne through the point G. within.

FIrſt conſider, through which ſides the line drawn by G. muſt paſſe, which are CB. and FA. the which increaſe till they meete in K. then bring your

your triangle YXZ. to be cut off, into the triangle 1X2. whose perpendicular X 2. may be equall to a perpendicular from C. (in your plot) to the base L M. so shall X 1. be the base of that triangle, which take, and set from L. to N. then say as before, if the perpendicular or shortest distance, from G. vpon L M. giue the perpendicular or shortest distance from C. vpon the same base L M. what the $\frac{1}{3}$ of K N? answer K O. then by O. drawe a parralell to K C. and so finish it in all points, as in the last probleme, and drawe the line V G W. so shall you cut off the figure WBAV. equall to Y X Z. the triangle giuen, with a line drawn through the point G. within, as was reqnired.

Prob. CXXIX.

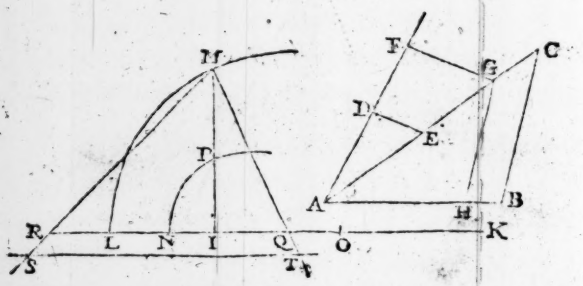
There is a plot as A B C D E. and in the side D E. is a point as F. from the which it is required to drawe a line as F G. to cut off the two triangles H. and I. and to take in the triangle K. equall to them both, so that the Trapezia A G F E. may be equall to the giuen plot A B C D E. &c.



FIrſt, bring the plot into the triangle A E L. equall thereunto, and then by the 39. probleme (counting E L. | L A. | and A B. | the three lines, and F. the point giuen) cut off the triangle F L M. and take in the triangle A G M. equall thereunto, by drawing the line
37. I. F G. according as in the ſaid 39. probleme, is taught, ſo ſhall you get the Trapezia A G F E. equall to the plot giuen, A B C D E. and then of neceſſitie muſt the triangle K. taken in, be equall to both the triangles H. and J. cut off together, which was required.

Prob. CXXX.

There is a peece of ground, as A B C. and adioyning to it another part as A D E. whoſe ſide A D. muneth forth by F. now it is required, to finde a point in the ſide A C. as G. from whence a parralell drawne to C B. as G H. and another to E D. as G F. in ſuch ſort, that the part G C B H. cut off, may be equall to the part F G E D. taken in, ſo that the whole Trapezia A F G H may be equall to the two triangles A B C. and A D E. together.



First

FIrſt betweene A C. and his perpendicular from B. finde a meane proportion which will be I M. alſo betweene A E. and his perpendicular from D. finde another meane which will be I P. then by the 54. probleme, adde their ſquares together, ſo ſhall the line M Q. be the ſide of a ſquare equall to them both, that done, by the 52. probleme, deuide the ſide A C. in power as A E. to his perpendicular from D. ſo that as the perpendicular from D. vpon his baſe A E. to A E. ſo the leſſer part of the power of A C. to the power of A C. being ſo deuided, which leſſer part in power is the line I R. whoſe ſquare adde to the ſquare of I M. ſo ſhall M R. be the ſide of a ſquare equall to them both, that done, ſay by the 23. probleme, if M R giue M Q. what A C. which is M S? anſwer M T. which take and ſet from A. to G. vpon the ſide A C. Laſtly, by G. drawe a parralell to C B. as G H. Alſo, a parralell to E D. as G F. ſo ſhall you cut off the Trapezia G C B H. and take in the Trapezia F G E D. equall thereunto, ſo that the whole Trapezia A F G H. ſhall be equall to both the triangles A B C. and A D E. together, which was required.

From whence a further knowledge may be deriued, that is, how to cut off from a triangle | Trapezia | or plot | any part or parts with a parralell to a crooked line, as with a parralell to F G H. &c. but of that and other things hereafter, if God ſpare life, in the meane time I requeſt thee gentle Reader to peruſe this well, ſo ſhalt thou be the readier to vnderſtand the reſt, and if thou profit any thing thereby, giue God the

praiſe, and lend me thy good word, ſo ſhall I thinke my paines herein well beſtowed, wiſhing thee, mee, and all the perfection of knowledge, which is to know God in Ieſus Chriſt, and ſo I commit thee and vs all to his mercifull protection.

***

FINIS.

A GEOMETRICALL EXTRACTION, OR A COMPENDIOVS COLLECTION

of the Chiefe and choyſe Problemes,

Collected out of the beſt, and lateſt Writers.

VVHEREVNTO IS ADDED,

about 30. Problemes of the Authors Inuention, being for the moſt part, performed by a better and briefer way,

then by any former Writer.

By IOHN SPEIDELL, *practitioner in the Mathematicks, and profeſſor thereof in London.*

LONDON,

Printed by *Edward Allde*, and are to be ſolde at the Authors houſe in the fields betweene Princes ſtreete and the Cockpit.

1617.

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TO THE HONORABLE

KNIGHT SIR IOHN EGERTON, *HEIRE apparant to the right honorable* Thomas *Lord* Elleſmere, *Lord high Chancelor of England.*

SIR,

I ſhould not ſo boldly aduenture, to ſhrowd this weak work of mine vnder your worthy Patronage, were I not aſſured, that as in your iudgement you are able to diſcerne, ſo in your noble diſpoſition, you will fauorably accept theſe firſt fruits of mine: In which kinde it hath pleaſed you ſome time to haue had conference with me, hauing to your bountifull rewards bene pleaſed to adde a plentifull report of your good opinion had and helde of me. Conſcerning the worke it ſelfe, though it be little, yet I hope it will appeare both for the matter and manner, greater in value then in volume, contayning of the chiefeſt things, partly collected out of others,

and partly of my owne, and performed by a more ſpeedy way then by any former Writer. Infine whatſoeuer the booke is or ſhall be, I eſteeme it too little, to expreſſe my thankfull minde for your many fauours, wherein I ſhall euer be ſtudious to ſupply my other wants, by my beſt endeuours, and euer reſt, At

Your honourable diſpoſition,

Io: Speidell.

To the Reader.

COurteous Reader, Hauing for these tenne yeares space, bene a professor of the Mathematickes in this Cittie, during which time, I haue instructed many Gentlemen and others (in Arithmeticke, Geometrie, Astronomy, And also, haue perused all the best authors, that I could get, in Latine, Italian, French, English, high Duch, and Flemish, and not hauing found this part which I here present to thy view, (consisting of the best, choyse, and most artificiall Problemes) so amplie, and after so breife a way performed by any: It hath made me therefore the more bolde to present it before thee, wherin I haue indeauoured to be briefe, knowing that much superfluitie of words doth more let and hinder, then any way further, or aduance the matter, yet not so briefe, as thereby to obscure or darken the worke in any kinde, but to make it the more cleere, easie, and plaine to the reader, and for the better satisfaction of such as desire the demonstration of euery thing. I haue coated in the margent such places of Euclide as tend thereunto, and for a further light, haue in the most principall places set Arithmeticall numbers by the Diagrams, whereby such as are desirous to make triall that way, may finde satisfaction. And not only these Problemes contained in this booke (well-beloued Reader) but much more viz. in Arithmeticke, Geometrie, Astronomie, Nauigation, Surueighing, fortification, achitecture, taking of heigths & distances, and all other parts of the Mathematicks, &c. may be performed by a Mathematicall

ticall Scale. now newly (this preſent yeare) by me inuented, farre beyond my former Scale made in Anno. 1607. *the which with all other Mathematicall inſtruments, are made by my louing friends* Mr Elias Allen, *ouer againſt* St. Clements *Church in the Strand, in* Braſſe; *and* Mr. Iohn Tomſon *in Hoſier lane by Smithfield (in Wood) and may alſo both in Wood and Braſſe be had, with the inſtructions therof by me at my houſe: Thus deſiring thee friendly Reader to peruſe this worke with iudgement, and not raſhly to ſpeake euill of him that hath not harmed thee, but taken much labour and paines day and night to compoſe, collect, and peruſe this work for thy good: ſo ſhalt thou walke charitably, and giue me occaſion to deſerue thy further loue, in ſetting forth a ſecond part, The which I promiſe to performe God willing, as I ſhall perceaue this to be reſpected, and ſo for this time I reſt, remaining,*

Thy louing friend

I. Sp.

A GEOMETRICALL EXTRACTION,

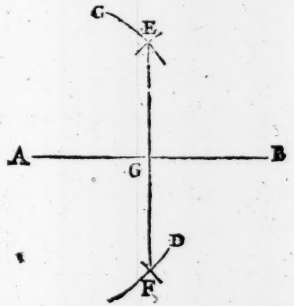
Teaching the Conſtruction of diuers of the moſt choiſe and chiefe Probleames.

Verie profitable, & in performance moſt pleaſant and delightfull.

Problemb I.

To deuide a line giuen into two equall parts at right angles.

Let A B. be a line giuen to be ſo deuided.



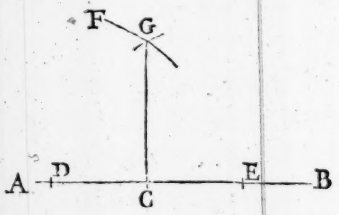
FIrſt ſet one foot in the end A. and opening the other foot at pleaſure to aboue halfe the line AB. make the arches C & D. aboue and belowe, then with the ſame diſtance ſetting one foot in the other end B. croſſe thoſe arches in E. and F. Laſtly drawe the 10. 1.

line E. F. which ſhall deuide the line A. B. into two equall parts in G. as was required.

Prob. II.

Vppon a point in a line giuen, to erect a perpendicular.

Let A. B. be a line giuen, and let C. be a point aſſigned therein, whereuppon it is required, to erect a perpendicular.



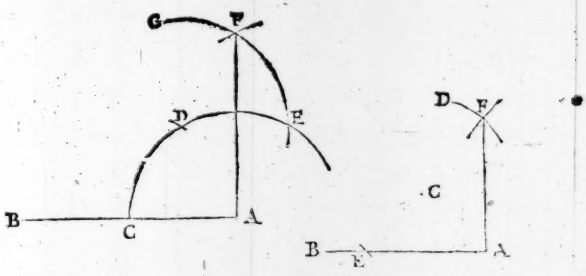
FIrſt ſet one foot in the point C. and open the other foot to almoſt the neereſt end A. and make the points D and E. on each ſide the point C. That done ſet one foot in D. and open the other foot at pleaſure
II.I. to ſome wyder diſtance, and make ouer head the arch F. Then with the ſame diſtance ſetting one foote in E. Croſſe the ſaid arch in G. Laſtly, drawe the line G. C. which ſhall be a perpendicular to A. B. vppon the point C. required.

Prob. III.

To erect a perpendicular vppon the end of a line.

Let A. B. be a line giuen, and let it be required to erect a perpendicular vppon the end A.

Set



SEt one foot in the end A. and opening your Compaſſes at pleaſure, make the arch CDE. Then with the ſame diſtance ſetting one foot in C. croſſe that arch in D. that done, keep one foot in D. and make with the other, the arch E G. Then ſet one foot in E, and with the ſame diſtance croſſe the ſaid arch E G, in F. Laſtly drawe the line F A. which ſhall be a perpendicular vpon the end A of the line A B. which was required.

Another way.

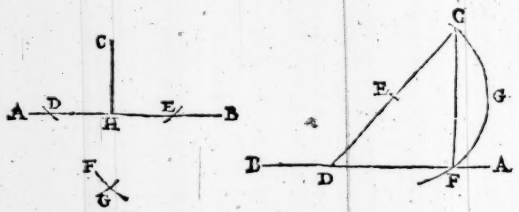
AGaine, let in the laſt *Diagram* on the right hand A B. be a line giuen, and it is required vppon the end A. thereof, to erect a perpendicular.

Set one foot in the end A. and with the other take a point at pleaſure as C. then keeping one foot in C. make aloft the arch D. and croſſe alſo the line A B. in E. That done, lay your Rular by the points E C. and where it croſſeth the arch D. ſet F. Laſtly drawe the line F A. which ſhall be a perpendicular to A B. vppon the end A. as was required. 31. 3.

Prob: IIII.

From a point aloft, to let fall a perpendicular to a line giuen.

Let A B. be a line giuen, and let C. be a point aloft, from whence it is required to let fall a perpendicular to A B.



SEt one foot in C. and opening the other foot almoſt to the neereſt end A. make in the line A B, the markes D. and E. Then ſet one foot in E. and with
12,1. the ſame diſtance make vnderneath the arch F. ſet alſo one foot in D. and croſſe the ſide arch F. in G. Laſtly, lay your Rular by the points C G. and drawe the line C H. which ſhall be a perpendicular to A B. from the point C. according to your deſire.

Another way.

AGaine, in the laſt *Diagram*, on the right hand, Let A B. be a line giuen, & let C. be a point aloft, from whence it is required to let fall a perpendicular to A B.

Laye

Laye the Rular by the point C. and any part of the line A B. as D. and drawe the line C D, which deuide into two equall parts in E. then keeping one foot in E. with the distance E C. make the arch C G F. to cut A B. in F. Lastly, drawe the line C F. which performeth the demaund. 3 1 3

PROB. V.

To drawe a Parralell to a line giuen.

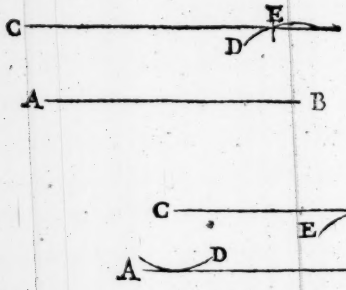
Let A B. be a line giuen, whereunto it is required to drawe a Parralell.

SEt one foot in the end A. & opening the other foot at pleasure, make ouer head the arch E. Then with the same distance, Setting one foot in the other end B. make the arch D. Lastly, lay your Rular by the tippes of those arches, and drawe the line F G. which shall be a Parralell to A B. as was required.

PROB. VI.

To drawe a Parralell to a line giuen, from a point assigned.

Let A B. be a line giuen, and let C. be a point assigned, from whence a parralell is to be drawne to A. B.



SEt one foote in the end A. and extend the other to the point C. then ſet one foot in B. & make with the ſame diſtance the arch D. That done, take the whole line A B. and ſetting one foot in C. with the
31. 1. other croſſe the arch D. in E. Laſtly, drawe the line C E. which ſhall be a parralell from C, to A B. as was required.

Another way.

AGaine, in the former *Diagram* belowe, let AB. be a line giuen, & C a point aſſigned, from whence it is required to drawe a parralell to AB.

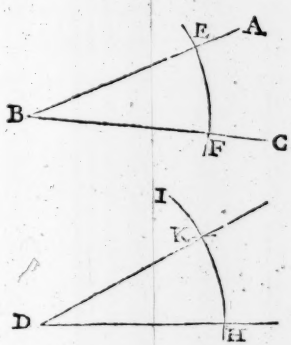
Set one foot in C. and taking the ſhorteſt diſtance to AB make the arch D. to touch the line AB. Then with the ſame diſtance ſetting one foote in the end B. with the other make the arch E. That done, lay your Rular by the point C. and the tippe of the arch E. and drawe the line C. F. which ſhall be a parralell to A B. as was required.

PROB: VII.

PROB. VII.

To make an angle, Equall to an angle giuen.

Let A B C. be an angle giuen. And it is required to make another angle equall thereunto.



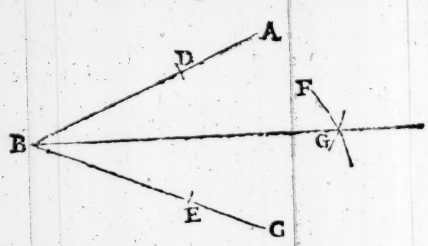
FIrſt drawe any where a line as D H. Then ſetting one foot in the angle B. open the other, to almoſt the end A. or the end C. and make the arch E F. Alſo ſet one foot in the end D. (of the line D H.) and with the ſame diſtance make the arch H I. That done, take the diſtance F E. and ſetting one foot in H. croſſe the arch H I. in K. Laſtly draw the line D K. which ſhall include the angle K D H. equall to the angle A B C. required. 23.1

PROB. VIII.

To deuide an Angle giuen into two equall partes.

Let ABC. bee an angle giuen, to bee deuided into two equall parts.

Set one

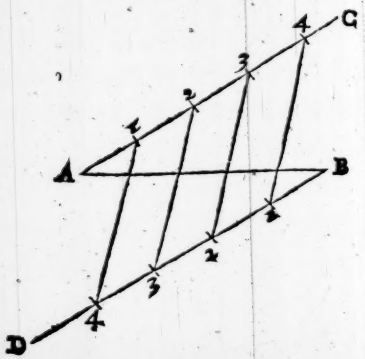


SEt one foot in B. and opening the other at pleaſure, make in the ſides, the points D. and E. Then with the ſame diſtance or ſome other, ſetting one foot
9.1 in E. make the arch F. that done, ſet one foot in D. and croſſe that arch in G. Laſtly drawe the line B G. which ſhall deuide the angle A B C. into two equall parts required.

PROB. IX.

To deuide a Line giuen into any number of equall parts required.

Let A B. bee a Line giuen, to bee deuided into fiue equall parts.



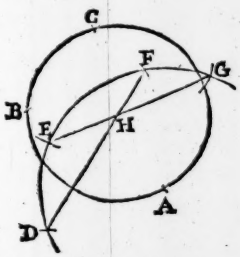
First

FIrſt from the end A. drawe a line at pleaſure, making with the giuen line AB. any kinde of angle, as the angle B A C. then by the ſeauenth Propoſition make the angle D B A. equall thereunto by drawing the line B D. That done, ſet from A. towards C. foure equall ſpaces at pleaſure, (alwaies one leſſe then the number whereinto the line giuen is to be deuided) Likewiſe beginning at B. ſet vppon the line B D. the ſame foure equall ſpaces from B. towards D. as you ſee on both ſides, numbred by 1.2.3.4. Laſtly, drawe croſſe lines from one point to the other, to cut the line A B. ſo ſhall you deuide it into fiue equall parts required. 9. 6.

PROB. X.

To bring three points not lying in a ſtraight line, into one circomference.

Let ABC. be three points giuen, to be brought into one Circomference.



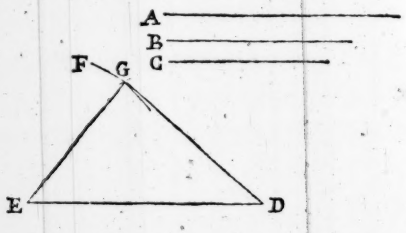
SEt one foot in A. and opening your Compaſſes to aboue halfe the diſtance AB. make the arch DEFG,

Then with the ſame diſtance, ſetting one foote in B. croſſe that arch in the points D F. and drawe the line D F. Then ſet alſo one foot in C. and with the ſame diſtance croſſe againe that arch in the points GE. and drawe alſo the line E G. which cutteth the line D F. in H. So is H, the Center: Therefore ſet one foot in H. and extend the other to any of the points A B C and make the Circle A B C. which ſhall paſſe by the three giuen points required.

Prob. XI.

Of three lines giuen, ſo the two ſhorteſt together be longer then the third, to make a Triangle.

Let A B, and C. bee three lines giuen, whereof it is required to make a Triangle.



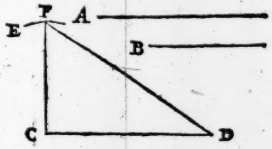
TAke the line A. and laye it downe from D, to E. Then take the line C. with your Compaſſes: and ſetting one foot in E, make the arch F. that done take the line B. and ſetting one foote in the end D. with the other croſſe that arch in G. Laſtly, drawe the lines D G. and GE. ſo ſhall you include the Triangle D G E. whoſe three ſides ſhall be equall to the three lines A, B. C. required.

22. I.

Prob. XII.

To make a right angled Triangle, the two containing sides being giuen.

Let A B. be the two Containing sides, and it is required, to make a right angled Triangle.

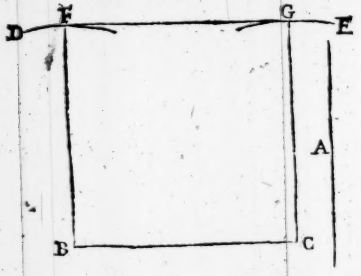


TAke with your Compasses, the line A. and laye that downe from C, to D. Then take also the line B. and setting one foot in the end C. with the other make the arch E. That done by the third proposition vppon the end C. erect a perpendicular to cut the arch E, in F. Lastly, drawe the line F D. so shall you include the right angled Triangle C D F. whose two containing sides C D, and C F. are equall to the giuen lines A, & B. which was required. 31.3.

Prob. XIII.

To make a square, the side being giuen.

Let A, be the side of a square and it is required to make out the square.

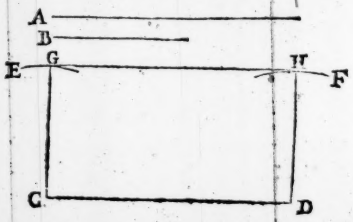


TAke the line A. with your Compaſſes, and laye that downe from B, to C. then with the diſtance B C: ſetting one foote in B. make the arch D. Set alſo one foot in C, and make the arch E. Then by the third Propoſition, erect a perpendicular vppon the end B, to cut the arch D, in F. That done, take the
46,1. diſtance BC, and ſetting one foote in F, with the other croſſe the arch E, in G. Laſtly, drawe the lines F G, and G C, ſo ſhall you include the Square BFGC, whoſe ſide ſhall be equall to the line A, required.

PROB. XIIII.

To make a Parralellograme or a long Square, the length and breadth being giuen.

Let A, and B, be the length and breadth giuen, and it is required to make the long ſquare.



Take

TAke the length A, with your Compaſſes, and lay that downe from C, to D. Then take alſo the breadth B. and ſetting one foote in the end C, with the other make the arch E. the like doe at the end D. and make the arch F. Then by the third propoſition vppon the end C, erect a perpendicular, to cut the arch E, in G. That done, take the length C D, and ſetting one foot in G. with the other croſſe the arch F, in H. Laſtly, drawe the lines G H. and H D. ſo ſhall you include the long ſquare C G H D. whoſe length and breadth ſhall be equall to the lines A, and B, required. 3 1. 3 3 1. 1.

Prob. XV.

To make an Equilater triangle, the ſide being giuen.

Let A, be a line giuen, and it is required to make an Equilaterall triangle, whoſe ſide ſhall bee equall thereunto.

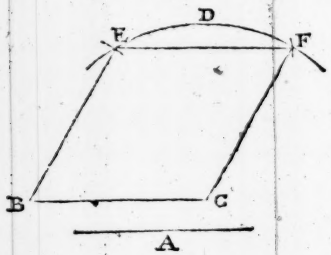
TAke the line A. and lay it downe from B. to C. Then with the ſame diſtance, ſetting one foot in B, with the other make the arch D. that done, ſet one

foot in C, and crosse the arch in E. Lastly, drawe the lines B E, and E C. so shall the Triangle B E C, be equilaterall, and his side equall to the giuen line A. which was required to be made.

Prob. XVI.

To make a Rombus the side being giuen.

Let A. be a line giuen, and it is required to make a Rombus whose side shall be equall thereunto.

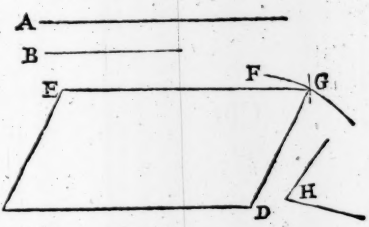


TAke the line A, and lay it downe from B, to C. then with the same distance, setting one foot in C. make the arch D. that done, set one foot in B, and crosse that arch in E. Againe, set one foot in E. and
1.1. crosse the same arch againe in F. Lastly, drawe the lines B E. E F. and F C. so shall you include the Rombus B E F C. whose side shall be equall to the line A, required.

Prob. XVII.

To make a Romboides, the length and breadth being giuen.

Let A, and B. be the length and breadth giuen, and it is required to make the Romboides.



TAke the length A, and lay it downe from C, to D. Then take alſo the breadth B, and ſetting one foot in the end C, with the other, take any where a point as E. and drawe CE. then with the ſame diſtance ſetting one foot in the end D, with the other make the arch F. That done, take the whole length CD, and ſetting one foot in E, with the other croſſe the arch F, in G. Laſtly, drawe the lines EG, and GD. ſo ſhall you include the Romboides CEGD, whoſe length and breadth ſhall be equall to the lines A, and B, required. 1. Pet. 31.1

Prob: 18.

To make a Romboides the length, and breadth being giuen, whoſe two oppoſite angles ſhall be each equall to an angle giuen.

Let in the firſt Diagram A, and B. bee the length and

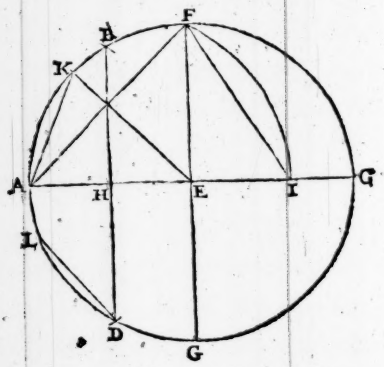
and breadth giuen, and let it be required to make a
23.1 Romboides whose length and breadth shall be equall
31.1. thereunto, and hauing two of his opposite angles, each equall to the angle H.

First laye downe the length from C, to D. Then by the seauenth proposition make the angle E C D. equall to the angle H. Yet drawe the line C E. but of the length of the line B, and then finish it as in the last proposition.

Prob: XIX.

To deuide a Circomference of a Circle into any part not aboue 10.

Let A B C D. bee a circle giuen to be so deuided.



First drawe the Diameter A E G, which deuides the Circomference into two equall parts. Then take the semi-diameter, and setting one foote in A. with the other foote make in the Circomference the points B and D.

B, and D. and drawe B D, which ſhall goe thriſe about the Circle. That done, by the firſt Propoſition deuide the Diameter A C. into two equall parts at right angles with F G. then drawe A F, which ſhall be $\frac{1}{3}$ part. That done, ſet one foot in H. (where the third part cutteth the Diameter A C.) and extend the other to F, and make the arch F I. then drawe the right line F I. which ſhall be $\frac{1}{5}$ part. 17. Diſi. 15. 4. 6. 4. 6. 2. 47. 1. 9 } 13 10 }

The ſixt part is alwaies the Semi-diamiter.

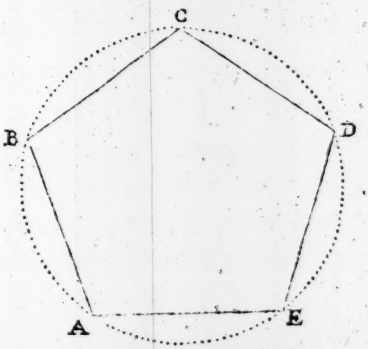
The $\frac{1}{7}$ part is halfe the third, viz. B H, or H D. For the eight part, deuide by the eight propoſition the angle A E F, into two equall parts, with the line E K, which cutteth the lymbe in K. then drawe A K. which ſhall be the eight part.

For the ninth take alwaies $\frac{1}{5}$ of the arch B A D, as D L.

The tenth is alwaies the line E I.

Prob. XX.

To make a Poligon of fiue equall ſides and angles, otherwaies called a Pentagon.

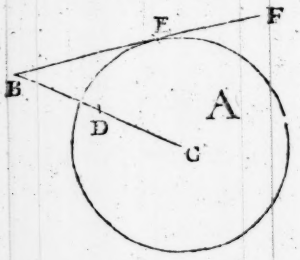


FIrſt make an obſcure Circle, then by the laſt Propoſition finde the fift part, which ſet fiue times about in the lymbe, as you ſee by the letters ABCDE, and drawe lines from point to point, ſo ſhall you include a Pentagon, as ABCDE, which was required.

Prob. XXI.

From a point aſsigned, to drawe a touch line to a Circle giuen.

Let A, be a Circle giuen, and let it be required to drawe a touch line thereunto from the point B.



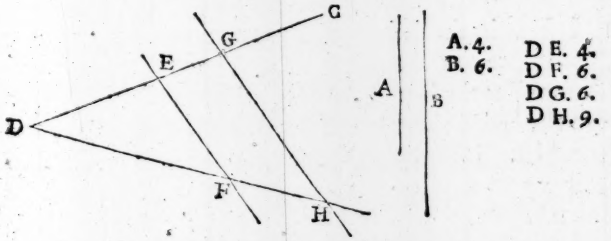
FRom the point B, drawe a line to the Center C, which deuide into two equall parts in D. Then keeping one foot in D, with the diſtance DB. or DC. croſſe the circle in E. Laſtly, drawe the line 17. 3. BEF, which ſhall bee a touch line to the giuen Circle A. as was required.

Prob. XXII.

Prob: XXII.

Vnto two lines giuen, to finde a third proportionall line.

Let A and B. be two lines giuen, and let it be required to finde a third line in proportion to them.

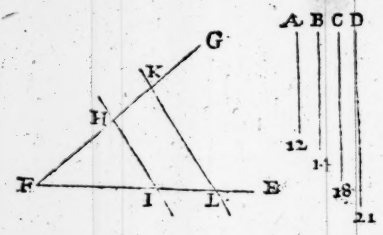


FIrſt make any angle as C D H. then ſet the line A, from D. to E, and the line B. from D to F. and alſo from D, to G. Then drawe E F. that done, by the point G. drawe a Parralell to E F. as G H. ſo ſhall D H, be the third proportionall line required. 11. 6.

Prob. XXIII.

Vnto three lines giuen, to finde a fourth in proportion, that is to performe the rule of three in lines.

Let, A B, and C. be three lines giuen, and it is required to finde a fourth proportionall line.



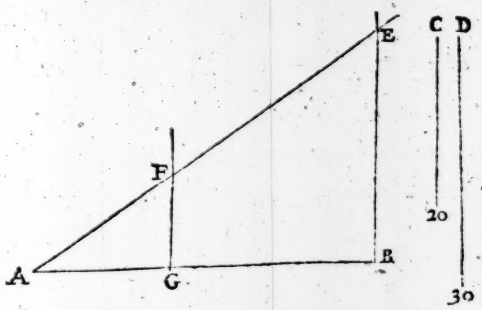
FIrſt as in the laſt propoſition, make any angle at pleaſure, as the angle E F G. Then take with your Compaſſes the line A, and ſet it from F to H. take alſo the line B, and ſet it from F, to I. and drawe the line H I. That done, take the third line C, and
12.6. ſet it vpon the line F G, viz. (alwaies vpon the ſame line where the firſt line A, was placed) from F, to K. Then by K, drawe a Parralell to H I. as K L. to cut F E, in L. ſo ſhall F L. be the fourth proportionall line required.

Prob. XXIIII.

To deuide a line giuen, into two parts, in proportion one to the other according to two lines giuen.

Let A B, be a line giuen, to be deuided into two ſuch parts, that the leſſer may be in proportion to the greater: as the line C, to the line D.

From



AF. 20.
FE. 30.
AG. 16.
GB. 24.

FRom the end A, drawe the line AE, making the angle BAE. then set the line C, from A, to F, and the line D, from F, to E. and drawe the line EB. Lastly, by the point F, drawe a Parralell to EB, as FG, to cut AB, in G. so shall AB, be deuided in G. as C, to D. which was required. 10.6.

PROB. XXV.

To cut off from a line giuen, any part or parts required.

Let in the last Diagram, AB, be a line giuen, and let it be required to cut off from it $\frac{4}{7}$ parts.

FIrst from the end A, drawe the line AE, making any angle as BAE, then set on any fiue equall parts from A to E, and also two of the same parts from A, to F. That done, drawe the line EB. Then by F, drawe a Parralell thereunto, to cut AB, in G. so shall AG, be the $\frac{4}{7}$ parts of AB, which was required. 9.6.